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JOURNAL

OF THE

American Veterinary Medical Association

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(Original Official Organ U. S. Vet. Med. Ass'n.)

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VETERINARY OPPORTUNITIES

THE advance of the veterinary profession has been phenomenal. Only a few of the old-time "farriers" or "hos" doctors remain. The services of educated veterinarians are in demand as never before. Formerly the veterinarian's work was confined to treating animals for disease; now the scope of this profession embraces the control of animal contagions and guarding the public health in pure-food inspection and other lines.

The standards in veterinary education are higher now than were standards in human medicine ten years ago.

There are splendid opportunities in veterinary lines for young men of character, who have been trained in one of the best veterinary colleges.

Food inspection is destined to soon be a regular thing in cities of the first and second class, and the veterinarian is the only man especially trained for this work. The control of animal diseases is demanding more and better men. There is a call for specialists in bacteriology, pathology; for practitioners in places where there are none; for veterinarians in the army and other lines.

Young men will do well to think of this profession before they decide upon their vocation.

It pays to be "a hail fellow, well met"—a good mixer, to have friends. Of course, the way to have friends is to be one. These and other things make for what is called tact. Tact has been defined as, "The moral sense of touch." Each day is a round in contending with the human problem. The human equation has just as many factors as our activities create. The one who is wise enough to meet them unperturbed, maintaining his equipoise, disposing of them without malice, profiting by the exercise of self-mastery and calm deliberation, is the one who will grow into the full stature of business and professional manhood. The one best test of a man's sanity is the way he manages himself. G. H. G.

THE CAREFUL USE OF TECHNICAL TERMS

CONFUSION exists in the use of several terms relating to veterinary science and livestock. Loose and sometimes erroneous terminology is often found not only in newspapers but in works of veterinary authorship. It is too much to expect that even a well-educated person will always know the correct name or the preferred form of expression for everything under the sun; but a professional man or a specialist in any field should certainly endeavor to use in a correct and discriminating way the technical terms relating to his particular branch of knowledge.

A common inaccuracy is the use of "thoroughbred" in the sense of "purebred." This is given some sanction by ordinary usage, but it should not be perpetuated by those who are supposed to know about such things. "Thoroughbred," in the strict sense in which it is used by persons well informed in animal breeding, is the name of an English breed of running horses, and when used in this way the word should be capitalized just as the name of any other breed. The preferred term applicable to "blooded" or "pedigreed" animals in general is "purebred." It is therefore just as absurd to speak of "a thoroughbred Jersey cow" as it would be to refer to "a Shorthorn Berkshire pig" or "a Shropshire Morgan horse." The correct expression, of course, is "a purebred Jersey cow." If veterinarians do not wish to appear ignorant before progres-

sive, intelligent stock-raisers they should be careful not to use the word "thoroughbred" except when referring to the particular breed of horses bearing that name, and should say "purebred" when that word expresses what they mean.

Another stumbling block is the use of the words "tuberculous" and "tubercular." Formerly these were used interchangeably and the question was only one of personal choice. In the interest of precision and uniformity, however, the National Association for the Study and Prevention of Tuberculosis adopted in 1906 in its official publications the term "tuberculous" to refer to lesions or conditions caused by the tubercle bacillus, and the term "tubercular" to describe conditions resembling tubercles but not caused by the tubercle bacillus. For example, nodules caused by something other than the tubercle bacillus may be tubercular in form or appearance, but they are not tuberculous; while a person or an animal affected with tuberculosis is tuberculous, not tubercular. This distinction is followed by careful writers on tuberculosis, but we still often read "tubercular" in the sense of "tuberculous," not only in the lay press but sometimes in professional papers. The newspapers of Washington, D. C., have recently been much exercised over a "tubercular school," which according to the distinction above drawn would mean a school building in the shape of tubercles but not caused by the bacillus of tuberculosis. What is really meant, of course, is a school for tuberculous children.

Occasionally, too, we read or hear the expression "per orem." This, unlike the terms already discusssed, is not merely a matter of discriminating usage but is actually erroneous. If we misuse our own language what can be expected when we venture into others? The Latin word "os" is a neuter noun, and the accusative case takes the same form as the nominative. The correct form is therefore "per os." The English equivalent of any such term is always safer for a person having only a meager knowledge of Latin.

Many writers on veterinary science show a lack of familiarity with the fine points of biological nomenclature—the system of Latin names given by scientists to organisms in the plant and animal kingdoms. This question involves both the correctness of the names themselves and the correct style of writing or printing them. The zoologists have an excellent international code which is generally followed by specialists in that field. In

bacteriology, however, the standards are not so clearly defined and there is more or less confusion and loose usage.

A veterinary writer should verify the names of organisms about which he undertakes to write and should be careful to use the latest accepted forms rather than obsolete names. One who, for example, today writes of the southern cattle tick as *Boophilus bovis* (instead of the corrected name *Margaropus annulatus*) discloses his lack of knowledge of the subject he is discussing. In printing biological names the preferred style is to use italics and to capitalize the generic name but not the name of the species (even though the latter may have been derived from a proper name), thus: *Ascaris equorum, Bacillus welchii, Streptococcus viridans.* Such names should not be confused with Latin names of anatomical parts, drugs, diseases, etc., such as membrana nictitans, tinctura iodi, purpura hemorrhagica, which are not governed by the same style. It is unfortunate that many text-books are not safe guides to accuracy and good style in matters of nomenclature.

SYMPTOMS FURNISHED BY THE TEETH

The New York Medical Journal for April 17, 1920, has an editorial on this subject. Among other things it says:

"One of the most interesting findings is the intimate relationship existing between the lateral incisors and the gonadal endocrine chain. We find that in the male the position of the testicle is indicated by the position of the lateral incisor of the opposite side; an undescended testicle will accompany an unerupted lateral incisor. A twisted lateral incisor is indicative of torsion of the cord. In the female the same relationship applies to the ovaries. Furthermore, a faintly developed lateral incisor indicates a similar condition of either ovary or testicle. When there is a complete absence of the lateral incisors in the female she will not bear children, and her menstrual discharge will be scanty. It seems as though the sex of the offspring is in direct relationship to the lateral incisors. The right one controls the male and the left one the female. If the right lateral incisor is missing the mother will give birth to girls only; if the left one is missing she will give birth only to boys. Of course this refers to a congenital absence of the teeth and not to their loss by accident or removal."

This is interesting and, if it is true and holds good in veterinary practice, would be an excellent method of determining on which side the undescended testicle in a ridgling is located. It would seem, if the statements made in the editorial referred to are correct and apply to the lower animals, that someone would have noted this peculiarity so far as ridgeling horses are concerned.

Will some of our readers supply us with data on this point so that we can confirm or disprove this theory so far as animals are concerned?

TUBERCULOSIS ERADICATION

ONE of the strongest speeches we have heard in whole-hearted support of tuberculosis eradication was given the other day by a Nebraska farmer. At first thought one would not expect that he would favor the plan of testing animals for tuberculosis. His own herd had been tested and forty-five out of a total of fifty-eight animals reacted and of course had to go to market.

In speaking of the matter, he said: "I was glad to find out definitely the fact that my herd had the disease and get them cleaned up. I am for tuberculosis testing of cattle. It is a protection for farmers."

The attitude of this man is different from the all too prevalent attitude several years ago. At that time many owners of livestock were somewhat opposed to an inspection of their herds in the endeavor to locate disease. They felt that if tuberculosis or any other disease was found that it would tend to react against their business and cast reflection on their efforts as livestock breeders. The large waiting list of farmers in every state who wish to have their herds tested at the present time is indicative of their desire to see the white plague driven from their communities.

There is some talk about having a bill introduced at the next session of the legislature to make testing for tuberculosis in cattle compulsory. We have the faith to believe that by the time the next legislature meets there will be sufficient sentiment throughout the state on the part of the livestock owners to make such a bill unnecessary. Here and there men will doubtless be found who are opposed to testing of their herds. These men can probably be influenced by their neighbors to the importance of this work.

The testing of tuberculosis in cattle is not simply a matter

that concerns the individual beef or dairy cattle owner. It is of public concern, for it concerns the man who buys meat or who purchases milk. The statement of Dr. Abt of Northwestern University Medical School at the conference in Chicago held for the purpose of discussing bovine tuberculosis, that the medical profession could not hope to eradicate tuberculosis from the human family until undivided attention was paid to the disease in cattle, is of far-reaching significance. It emphasizes the fact that the campaign of eradication has more than simply an economic aspect. It concerns all of us.—*Editorial in Daily Drovers Journal-Stockman, Omaha, Neb.*

ALL ABOARD FOR ST. LOUIS CONVENTION

FOR MEMBERS who plan to attend the A. V. M. A. convention in St. Louis, August 28 to September 1, special transportation arrangements have been made for a really enjoyable and comfortable trip. The Wabash Railway has been selected as the official route from central territory, and special Pullman arrangements will be provided from all the principal gateways, where direct connection is made from all points for fast, convenient service to St. Louis.

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THE VETERINARY OUTLOOK FROM A TEACHER'S VIEWPOINT[1]

By PIERRE A. FISH

Professor of Veterinary Physiology, New York State Veterinary College, Cornell University, Ithaca, New York

TO THOSE without the gift of prophecy any attempt to penetrate the future is futile; but a consideration of present and past events may enable one to reach conclusions which have more or less bearing on the trend of future events. It is obvious that if the number of domesticated animals were markedly decreased and there were a tendency to continue toward the vanishing point; if the production of such animals were unprofitable and if there were no demand for them, there would be little use for veterinarians. Until science can produce food and raiment entirely from synthetic or vegetable sources; until the fertility of the soil can likewise be assured from other sources, we can safely assume that there will be a demand for animals to sustain and support the human race. Our dependence upon animals existed even before the beginning of civilization, and with the progress of the centuries this dependence has been intensified rather than weakened. Higher and better types have been evolved, and with improved breeds there have been increased values. With increased values there has been an increased demand for protection against the ravages of diseases peculiar to animals as well as those transmissible to man. The tendency in recent years has been toward the production of better animals and better veterinarians to safeguard their health.

Statistics from census reports show that there have been fluctuations in the number of certain groups; some have shown a considerable increase while others have shown a marked decrease. This feature has been exemplified in the census report for 1920, which shows a loss of 18,604,376 among the horses, asses and burros, and sheep. This loss is partially offset by a gain of 9,623,211 among mules, cattle, goats and swine, diminishing the total net loss to 8,981,162. The loss among the horses, asses and hurros, 1,200,894, is a little more than compensated

[1] Presented at the meeting of the Genesee Valley Veterinary Medical Association, Rochester, N. Y., January 4, 1922.

for by the gain in mules, 1,348,735, leaving a net balance in favor of the mules of 147,839. This would indicate that, as a source of motive power, the mule is supplanting the horse to some extent. The chief source of loss to be considered is the sheep, in which the average *annual* rate of decrease for the decade has been 1,740,348. This rate of decrease has been more rapid than the rate of increase among the cattle, goats and swine, and therefore leaves a deficit of over 8,000,000 in the total of all the domesticated animals. In the routine of the general practitioner there is probably less call for his service for the sheep than for the other animals, and the loss, serious as it is, doubtless affects his practice much less than if the cattle or swine were involved. Among various possible factors concerned in this diminution in the number of sheep there may be two of economic interest. If wool may be imported from other countries more cheaply than it can be produced here, there would be little incentive in raising sheep for that purpose. If the public taste prefers beef and pork to mutton, the production of sheep for food must necessarily adjust itself to the demand.

Summarizing the last census report relative to the number of the domesticated animals, it would appear that there has been an actual increase in the animals with which the veterinarian is more directly concerned—cattle, swine and horses (if the gain in mules be substituted for the loss in the latter group). The census report does not include the number of pet animals, which, in the larger cities, it may be inferred has not been diminished, since numerous veterinarians derive their income from this source. It is interesting to note that the census reports New York as leading all the other States in the number of horses *not* on farms, with Illinois second and Pennsylvania third, although the number is approximately one-half of what it was in 1910.

The census has also furnished data relative to the value of livestock on farms, and here, in spite of a decrease in the number of animals, there is given a very decided increase in the values. For 1920 the value of livestock on farms is given at $7,605,917,190; for 1910, $4,760,060,093, an increase of $2,845,857,097 or about 60 per cent. New York is one of nine States reporting values in excess of $300,000,000. The value of cattle on farms in the United States in 1920 was $3,634,334,624, nearly one-half of the total value of all livestock. The States

reporting the largest values for cattle on farms in 1920 were Texas, Iowa, Wisconsin, New York and Illinois. The average value per head, for 1920, was: For horses, $90.13, a loss of about 15 per cent as compared with the 1910 valuations; for mules, $142.88, an increase of about 14 per cent; for cattle, $54.40, an increase of 124 per cent; for sheep, $11,30, an increase of 154 per cent; for swine, $16.66, an increase of 142 per cent.

The Yearbook of the United States Department of Agriculture gives information showing that in New York State in 1910 there was the ratio of one veterinarian to 5,315 domesticated animals with a value of $193,390. In 1920 the ratio increased to one veterinarian to 5,898 animals with a more than doubled valuation of $393,704. The figures from the latest census returns, for either the number of animals or their valuation, would indicate that the outlook for the veterinary practitioner is not discouraging.

The primary necessity of a veterinarian is material upon which to practice. The evidence already presented indicates that the material is available, and the very decided increase in the valuation of this material points toward an increased demand for the practitioner's services. Is the demand being met, and if not, what are the reasons for it? Just prior to the outbreak of the World War in 1914 statistics were published which showed that the output of veterinary graduates in the United States (750) was 50 per cent greater than the combined output of Denmark, Germany, France, Sweden and the British Isles, and, with the exception of Denmark, that in proportion to the population of the countries concerned, the output here was double that of Germany or Sweden and even greater than that in the case of France or the British Isles. At that period the evidence indicated that the quantity of veterinarians was sufficient—perhaps more than sufficient—and that steps should be taken to improve the quality of the practitioners.

With the entrance of this country into the war in 1917, the veterinary along with other branches of education became more or less disorganized, but in spite of this an impetus was given to higher standards for veterinarians through the action of the War Department in insisting upon high educational requirements for those entering its service. The American Veterinary Medical Association, after a number of years of effort, took a

similar stand. The acceptance of the higher standards resulted in the discontinuance of all but two or three of the private schools. In the past the private schools had been the source of the greater portion of the veterinary output, but higher standards meant fewer students, and the financial loss involved rendered the continuance of these schools unprofitable.

During the post-war period of three years there has been a marked decline in the number of students taking the veterinary course in the thirteen State schools now existing. The probability is that there has been a similar decline in the two or three remaining private schools. The following statistics are based upon data compiled by Dean D. S. White of Columbus, Ohio. During 1919-20 the total attendance in all classes in the State schools was 800, only a few more than the output from the senior classes of the State and private schools five or six years before. The seniors of 1919-20 numbered 190, about one-fourth of those of the previous period. In 1920-21 the total attendance dropped to 708 and in 1921-22 to 641, representing a successive loss of 11 and 9 per cent, respectively. In the present situation interest centers chiefly around the entering class, for here will be the first indication of a continued loss or an upward trend. In 1920 the entering class numbered 164; in 1921 it numbered 163, showing that, for the present at least, the downward tendency has been checked. In 1920 two of the State schools showed a combined gain of five in the freshman class, while the remaining eleven schools showed a loss of 108. In 1921 seven of the State schools showed a gain of 32 freshmen, while six showed a loss of 34. From these figures it may be inferred that a balance has been struck against the losing forces; that several of the schools have not only held their own but made some gain, and that with favorable conditions there will be still further increase in the future.

Since the war there has been an increase in the attendance at the veterinary schools in France and Germany. The total attendance at the principal veterinary schools is given at 2242.[1] This, compared with the attendance at the American schools for 1921, shows an increase of about 250 per cent. Evidently a different set of factors is in operation here than in the countries mentioned. In the past France and Germany trained a large percentage of their veterinary students for military serv-

[1] D. S. White. Our Profession. Jour. A. V. M. A., April, 1921, p. 14.

ice. It may be assumed that France, still maintaining a large army, utilizes a large number of veterinarians in that branch. In the case of Germany it is more difficult to explain the situation.

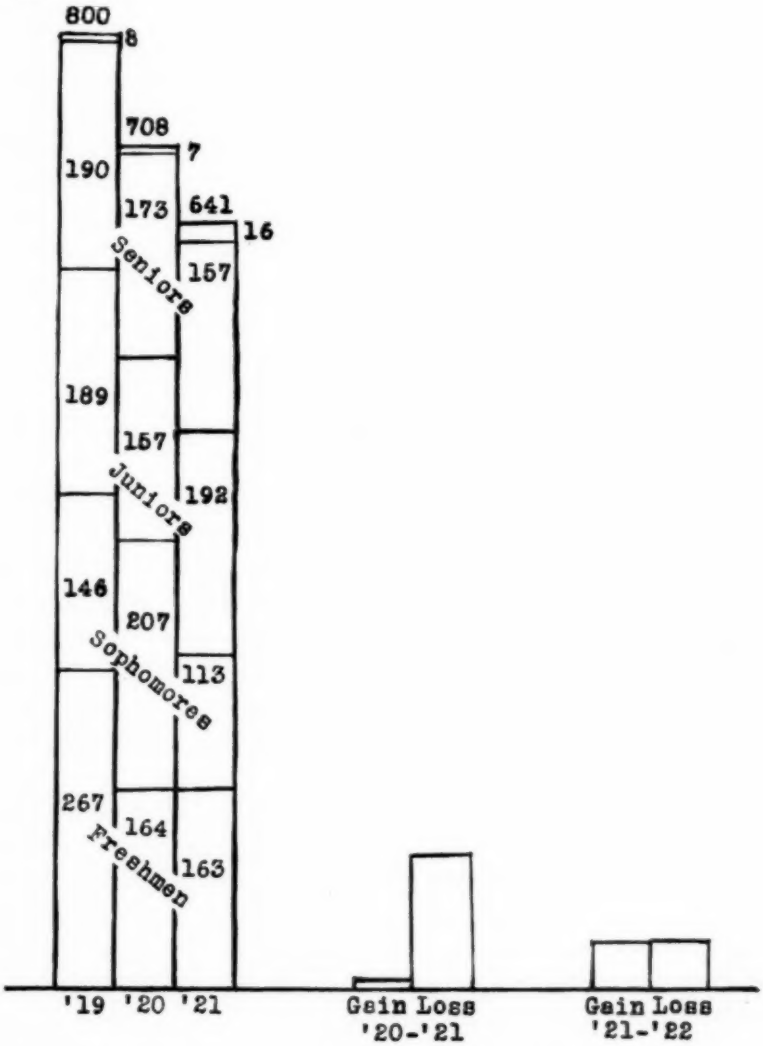

Diagram showing attendance at State schools for college years 1919-20, 1920-21, and 1921-22. The total attendance is noted at the top of each column and the figures within the spaces indicate the number in each of the classes. The small diagrams at the right show the gain and loss in the entering classes for 1920-21 and 1921-22. The large diagram shows that the greatest loss, after matriculation, occurs between the freshman and sophomore years

The backwash of the war has brought to the surface some factors which may have a more or less direct bearing upon the

decreased number of veterinarians in this country. It is assumed that the number has actually decreased, although as yet it has not been possible to confirm this by obtaining the actual number from the last census for comparison with the 11,562 veterinarians given in the 1910 census. Some have returned from the war to find their practices disrupted or taken over by other veterinarians, and have consequently taken up other lines of work. Some, after the excitement of their war experiences, have resumed practice discontentedly and have developed a more or less pessimistic outlook for the future. Some have returned to even greater opportunities with renewed confidence and optimism. Some city veterinarians have been unequal or unwilling to adjust themselves to the task of developing a country practice which, on account of a certain amount of displacement of the horse by the automobile, appears to be the principal source of income for veterinarians henceforth. In the backwash of the war there also looms large the difficult matter of readjustment to normal conditions. This is the period in which we find ourselves at present, and it affects many other lines of endeavor quite as severly as it does the veterinary profession. The prosperity of the veterinarian has come to be closely linked with the prosperity of the farmer. With foreign markets unsettled, with rates of exchange wildly fluctuating and foreign trade thereby greatly diminished, the farmer, and incidentally the veterinarian, reflexly suffers the effects. Any reaction which depresses general prosperity depresses the veterinarian as well.

The enforcement of higher educational requirements is always followed by a decrease in attendance, but the effect has been unusually severe when applied during a period of readjustment with its depressing accompaniments. This, with other factors, has had much to do with the decline in the number of veterinary students. It is probable that no other profession showed a greater degree of patriotism in participating in the late war than did the veterinary profession, and it is probable that no other profession showed so great an amount of disorganization in its ranks after the war was over. In this trying period some practitioners have felt that their practice has been curtailed through State and Federal interference. Although it has been intimated that such a condition would be temporary and further intimations have been made that

increased work would result in the future, some have nevertheless become discouraged and perhaps diverted into other lines of work. Under such conditions they would naturally forbear to urge young men to enter this field of endeavor, and thus another factor may be introduced in accounting for a decrease in veterinarians.

In an offensive or defensive attack against plagues or epidemics which may gain a foothold in our country, or a crusade for the eradication of an infectious disease which has been long established in our midst, organized effort with a controlling head is the efficient method of gaining the desired victory. Such an arrangement is effective in military procedure, and, as in time of war, there may arise the necessity for the sacrifice of a certain amount of individual liberty in order to insure success; but it is imperative that the plans of the campaign must be formulated as correctly and completely as possible or the victory will be materially delayed.

In the mists that are at present enveloping our profession, there is assuming more or less definite form the question of State medicine. There are those who believe that it is inevitable as applied to veterinary practice and that certain benefits may accrue from it. To most veterinarians it is doubtless a vague and indefinite question. Numerous attempts have been made to enact such legislation, usually by the laity, relative to the medical profession; but in the main this has been strenuously opposed by the majority of the physicians. The compulsory health insurance law, with its provision for restricted fees, free medicines, free surgical treatment, is an example. The system has been put in effect in some foreign countries and it has been reported that the physicians concerned were opposed to it. The problems of the veterinarians are not identical with those of the physicians, but there are some points of contact. Laws relative to public and animal health are distinctly medical problems and should emanate from or be vouched for by the medical and veterinary professions.

State laws are supreme within the boundaries of the State. Federal agents can not undertake work in connection with animal diseases within those boundaries except with the consent of the State, in cooperation with the State authorities and in conformity with the State laws; but the Federal authorities are interested for the protection of other States where inter-

state traffic may occur in diseased animals. State medicine has been defined by a Federal veterinarian as follows: "The activities of both the State and National authorities and those in active association in the prevention and control of disease constitute State medicine, or, in other words, organized action in combating disease." This would seem to imply that on the veterinary side a form of partnership exists or should exist between the State and Federal governments in connection with State medicine. Usually organized action is invoked in connection with infectious disease, and this is doubtless what is intended in the definition, but the ordinary practitioner has much to do with sporadic disease, and it has been claimed that if statistics were kept a much greater percentage of loss would be shown in the latter than in the former group. State medicine, in part, already exists for some infectious diseases; it is not necessary for all. Especially virulent infectious diseases or those which affect large areas need cooperative or organized action for their eradication, but there is not true cooperation nor complete organization in such effort unless duly qualified local practitioners are utilized.

The subject of State medicine is an intricate one and the farther one goes the more intricate it gets, but some fundamental questions may be asked: Will the individual veterinarian be simply a cog in a political machine? Will State medicine encourage individual initiative? Will it serve as an incentive to higher ideals? Will it stimulate to greater effort, or will it adapt the service rendered to the salary or fees received? Will the individual freedom of the practitioner be enlarged or restricted? Will State paternalism be ultimately extended to other professions such as law and theology? Practitioners treat bodily ills; theologians are concerned with spiritual ills. Are the latter as important as the former? State medicine has a bearing on the outlook for the veterinary practitioner and should receive very full and careful consideration.

One weakness of the veterinary profession has been in its lack of organization. There has been no time when organization is needed so much as at present. The direction of veterinary service should be placed in the hands of veterinarians, not in the hands of politicians. Veterinary administration by veterinarians! Its work is too serious and too important to be subjected to the caprice of political expediency. In the late

war the enemy because of superior organization won four years of victories, and it was not until a similar organization was effected in the ranks of the Allies that the tide of victories turned in their favor. Practitioners are the backbone of the profession. The backbone is the support of other skeletal elements. The combined action of veterinarians can successfully support policies beneficial to their own interests and to the livestock industry. By the same token they can defeat those projects which are inimical to their progress.

In the commercial world there have been instances where changed conditions have rendered it necessary for manufacturing plants to adapt their machinery and equipment to a totally different kind of production if they were to continue their existence. There has been a similar change in the character of veterinary practice and a similar necessity for veterinarians, on account of the diminishing horse practice, to adapt themselves to the increasing demands for their services in relation to the other domesticated animals. The opportunity is different but it exists with undiminished force.

The topics thus far discussed have a bearing on the outlook for the veterinary practitioner. It has been the aim to present the facts as they appear, whether encouraging or discouraging. False optimism has no advantage over pessimism and is probably more misleading. The evidence from the census reports indicates unmistakably that there should be as great a demand as ever for the service of veterinarians. The data from the attendance at the veterinary schools show that half of the institutions have checked the loss and made slight gains over the previous year. The schools at present are balancing on the edge of loss and gain and another year or two will be required for positive information. Whether there should be a greater or diminished tendency toward State medicine as it affects the practitioner should be most carefully considered and the utmost effort made to determine the possibility of its developing into a benefit or a menace. The loose organization of the profession should be tightened into a more efficient mechanism. If properly effected it may prove to be a very potent factor in the outlook for the veterinarian. The inference from these statements is that there are positive factors favorable to the outlook, but there are also factors which may work for or

against favorable results and more time will be required for this determination.

In this day and age remunerative returns are usually the first consideration in all lines of endeavor. This must necessarily be reckoned with, but there are some who have ideals beyond that. There is nothing higher nor finer than the veterinary profession in opportunities for service. There is nothing more uplifting than the alleviation of the suffering of the dumb creation confided to our care, guarding their welfare, and assisting in safeguarding the public health from communicable diseases. There is a satisfaction beyond payment in watching the repair of a wound, in healing bruised tissues and assisting Nature in restoring the weak and debilitated body to sound and vigorous activity. The reward comes, not necessarily with success, but with the satisfaction of honest work faithfully performed.

DEATH FROM SNAKE BITES RARE IN U. S.

Although the average mortality from American venomous snakes is a little more than 10 per cent of the persons bitten, death from snake bites is quite rare, because relatively few persons encounter or are bitten by the dangerous species.

The most venomous of our native snakes live in lonely, little-settled districts, often on stony or swampy land that can not be cultivated. Usually they disappear at the approach of man, and while they may strike if provoked, the popular belief in respect to the distance they can strike is erroneous. Three-fourths of their own length is about the greatest distance possible. If the legs are well protected when one is going into deep woods or places known to be infested by rattlers or other poisonous snakes, there is slight chance of being bitten.

As the food of snakes consists of living prey, they can not be killed by poisoned baits. The only method thus far devised to kill them seems to be clubbing or shooting. This is best done in early spring, when they are still sluggish after the winter hibernation. Allowing hogs free run of infested land may reduce the number of snakes. However, the popular idea that hogs are immune to snake bite is probably based on the impenetrability by the venomous fangs of their thick skin and adjacent layer of fat.

THE PRESENT STATUS OF VACCINATION AGAINST ABORTION DISEASE OF CATTLE [1]

By E. C. SCHROEDER

Superintendent of Experiment Station, United States Bureau of Animal Industry, Bethesda, Maryland

IN A PAPER on infectious abortion of cattle presented at a meeting held at the University of Pennsylvania on February 20, 1920, I made the following statements:

> I wish to make a casual reference to the use of biological products in their relation to abortion disease. As you probably know, with the exception of living cultures of abortion bacilli, injected subcutaneously before conception, such products have not given much promise.
>
> Living cultures, emphatically, should be used only in infected herds under the guidance and close supervision of a qualified veterinarian. What the injection of such cultures may do in addition to the claims advanced by those who recommend their use, remains questionable, and should be made the subject of an exhaustive investigation.

And in a paper presented at the last annual meeting of the United States Livestock Sanitary Association I made the following statement:

> An examination of the available data on the use of living cultures of abortion bacilli to secure immunity shows three things: One, that very few tests have been made under strict, experimental conditions; two, that the number of abortions among cattle that have received injections some time before conception drops with a noteworthy frequency to approximately 6 per cent, no matter what it may have been before immunization was attempted; and, three, that the number of abortions among treated is lower than among untreated cattle kept under the same conditions.

The last statement was based on the records published by investigators of whom it confidently may be assumed that their suspensions of live abortion bacilli were really alive and reasonably free from contaminations, and not on the experiences of persons who have attempted to immunize cows against bovine infectious abortion with alleged suspensions of live abortion bacilli of a viability and quality that they could not or did not test. The experiences of such persons, as most of us know, in our country at least, are oftener disappointing than encouraging, and seem to justify the belief that the available methods of vaccination against bovine infectious abortion commonly are useless, and not rarely dangerous or worse than useless.

I do not believe that the quoted statements require revision

[1] Presented at the University of Pennsylvania, February 28, 1922.

at the present time, or that it is necessary to supplement them with a lengthy tabulation of the available figures on the results obtained by different investigators with various preparations of living and dead abortion bacilli, used either alone or in combination with so-called antiserum. The data are as accessible to you as they are to me, and if you will study them as I have studied them, you probably will reach a conclusion not unlike the one I have reached, which may be expressed as follows:

Though it can not be denied that the injection, some time before the beginning of pregnancy, of live abortion bacilli into cows that are exposed to bovine infectious abortion markedly reduces the proportion of abortions among them, it is equally indisputable that the injection of cows with reputed but not proved suspensions of live abortion bacilli has given contradictory, far from satisfactory, and often wholly disappointing results.

This conclusion shows plainly that something is wrong somewhere; either the investigators have misled those who depend upon them for guidance and relief, or the material used in common practice must bear the blame.

In this paper, first, I will attempt to show that immunization against bovine infectious abortion is a peculiar problem, quite unlike immunization against other infectious diseases; second, I will call attention to a number of things that require consideration before the common use of abortion vaccines should be approved; and, third, I will state the results obtained by the application of a few simple tests to twenty-four samples of reputed or alleged suspensions of live abortion bacilli purchased on the open market. And, when I get through, I believe you will know what is wrong, and will have a fairly clear idea of the present status of vaccination against abortion disease among cattle.

PECULIARITY OF THE PROBLEM

The peculiarity of bovine infectious abortion is that it attacks an organ in the bodies of its subjects which is not constantly or continuously in existence, and that its subjects, when the intermittently existing organ is absent, are virtually immune against the disease. The immunity is not merely a mechanical phenomenon due to the absence of the organ through which the disease manifests itself, but a true immunity, be-

cause the prime causative microorganism of the disease does not seem to have the power to flourish in or to attack the continuously present organs of its subjects. The true habitat of the microorganism, and the real seat of its pathogenic activity, is the fetal envelope, and though it often enters and persists during varying periods of time in the udder, it does not seem to multiply abundantly in this organ and has not been proved to cause disturbances. As far as we know, everything that happens to the cow and the fetus when abortion disease occurs is consequent on the pathological changes in the fetal envelope.

After we recognize this peculiarity it will not be difficult to see that injections of abortion bacilli aim at the production of antibodies in an immune animal for the protection of a susceptible organ which is later to develop, and we will understand why it is important to time the injections with great care.

We may say that the body of a nonpregnant cow, which receives injections of abortion bacilli and subsequently becomes pregnant, is related to the fetal membranes in a manner that somewhat parallels the relation between a diphtheria antitoxin horse and the child that is protected through its antibody-enriched serum.

The thing that really has happened when a cow has been immunized against abortion disease is that she has become a reservoir of antibodies which are not needed for her safety, but which have the required potency to destroy abortion bacilli before they can reach her uterus, or, if they should reach her uterus during pregnancy, to prevent their rapid and profuse multiplication in the placentæ.

That the antibodies rarely become excessively abundant, and can not be made so easily, we may infer from the frequent occurrence and often long persistence of abortion bacilli in the udders of infected and seemingly immune cows.

When the udder is infected abortion bacilli almost invariably are present in the supramammary lymph glands, and this implies that a stream of the bacilli flows from the infected udder into the body, where, assumably, they serve to stimulate the production of antibodies; but, notwithstanding this stimulation, the antibodies produced are not sufficient commonly to cause a rapid cleaning of the udder, or, as is shown by the frequent presence of abortion bacilli in the placentæ of cows

which have infected udders but do not abort, to prevent wholly their penetration to and multiplication in the uterus during pregnancy.

Factors like this show why, in addition to carefully timing protective injections of abortion bacilli, it is reasonable to believe that either large or repeated doses are required to secure an effective immunity. And if we bear in mind that the induced immunity must last throughout nearly the whole period of gestation, or must not be too passive or short lived, we will understand why better results are obtained with live and virulent than with attenuated and dead cultures.

If my conception of the matter is true and if I have expressed myself clearly, you will agree with me that immunization against abortion disease, as it has the character of what we do to secure immunity against some other infectious diseases by injecting their subjects with an attenuated, innocuous virus, is very peculiar in that it requires the deliberate exposure of its subjects to massive doses of an unattenuated, fully virulent virus.

Add to this that cows injected with living abortion bacilli may become, through the infection of their udders, long persistent, dangerous carriers and disseminators of abortion bacilli, and you will see that the peculiar problem is burdened with serious complexities, which we should not ignore when we ask ourselves whether the use of the available methods of immunization against bovine infectious abortion can safely be given our approval.

THINGS THAT REQUIRE CONSIDERATION

Under this heading I shall not attempt to include all the things that require more consideration than they have received, but only several of those that impress me as being especially important, and among them the first is the strains of the abortion bacillus that may safely be used to make suspensions for the protective injections.

Recently Dr. W. E. Cotton, the assistant superintendent of the Experiment Station, and I had the opportunity to study three strains of the abortion bacillus derived from outbreaks of abortion among swine. One strain was obtained from Indiana, a second from Illinois and the third from California. The three strains in all their characteristics, like growth on

culture media, microscopic appearance, tinctorial character, sensitiveness to positive and negative abortion sera, etc., are undoubted Bang abortion bacilli. However, in their pathogenicity for guinea-pigs they are not wholly like any of the numerous strains of the abortion bacillus, isolated from outbreaks of abortion among cattle, that we have studied; and a particularly noteworthy fact is that the three swine strains, because of this difference in pathogenicity, resemble one another more closely than any one of the three resembles any strain isolated from cattle. The lesions caused in guinea-pigs are grosser in character; bone lesions are commoner; lesions often are caused in parts of the body in which the cattle strains have never been observed to cause lesions, like the development of post-orbital abscesses which lead to a forward pressing and the more or less rapid destruction of the eyeball, etc.

One of the swine strains has been proved to be a true abortion-causing organism for both swine and cattle, and this must be looked upon as quite important when we know that sows, as a rule, are stronglyy resistant against strains of abortion bacilli isolated from outbreaks of abortion among cattle.

As the three swine strains were obtained from three States, and as they are the only strains from outbreaks of abortion among swine that we have been able to procure, we can not dismiss their difference from cattle strains, in a character in which they closely resemble each other, as a matter of no significance, or as a peculiarity that probably will not be repeated in other strains from swine that may be studied in the future. It is wiser to assume that the evidence, though it may not be conclusive, indicates that the type of the Bang abortion bacillus that attacks both swine and cattle is more virulent for swine and guinea-pigs than the commoner type that apparently is restricted to outbreaks of abortion among cattle.

How about using strains of the abortion bacillus in the preparation of suspensions of mixed strains for the protective injection of cattle, like the described swine strains? Would it be fostering and facilitating the spread of a super- or multivirulent kind of bovine infectious abortion that causes serious losses alike among swine and cattle?

The second thing that requires consideration is the medium in which abortion bacilli intended for use as a vaccine should be suspended.

Several years ago Dr. Cotton and I observed that abortion bacilli suspended in normal salt solution may rapidly lose their pathogenicity for guinea-pigs. We were too busy with other studies at the time to give the matter further consideration. Recently we recalled the observation and found on making further tests that suspensions of abortion bacilli in normal salt solution, kept at room temperature, occasionally show a greatly reduced virulence for guinea-pigs in 24 hours, and fail to cause lesions after 48, 72 and 144 hours. Similar suspensions kept at incubator temperature at times showed a marked reduction but not a total loss of virulence in 144 hours. The loss of virulence for guinea-pigs was accompanied by a loss of viability on culture media. The suspensions tested were made with five different strains of the abortion bacillus, hence the loss of virulence and viability is not attributable to the exceptional character of one unusual strain.

Suspensions of abortion bacilli in normal cow-blood serum and in blood serum from cows that react to serological tests for abortion at times showed a perceptible reduction but not a complete loss of virulence for guinea-pigs after 144 hours, and this is true alike of suspensions at incubator and room temperatures.

Why some suspensions, not all, in normal salt solution, at room temperature, not exposed to light, lose their pathogenicity for guinea-pigs and their power to multiply on culture media so rapidly, has not been determined. The number of tests that have been made is not sufficient to justify the conclusion that this is a common phenomenon, but it is of sufficient importance to require serious consideration, because we have no reasons to believe that dead abortion bacilli possess immunizing value, and we know that suspensions of abortion bacilli can not be marketed economically unless the interval of time between their preparation and use is much longer than a few days.

The third thing that requires consideration is the conditions under which the bacteria for suspensions are grown. From some observations made at the Experiment Station it seems that abortion bacilli grown in receptacles in which the air is rich in carbonic acid gas are not as readily or perfectly agglutinated by positive abortion sera as those grown in ordinary atmospheric air. Whether this is related to increased abundance and rapidity of growth in the presence of carbonic acid

gas has not been determined, neither has it been determined whether culture media of different kinds produce similar variations, or whether such variations are correlated with differences in viability, pathogenicity, immunizing value, etc.

Since the abortion bacillus is an exceptionally delicate organism which varies greatly in the effect of different, unknown conditions on its vitality, another matter that requires consideration is the containers in which suspensions should be dispensed. The containers used by commercial producers vary in size, shape and color, and those made of ordinary clear glass, if the abortion bacillus is as quickly killed by light as some other pathogenic bacteria, should be discarded at once.

Whether sufficient attention has been given to the age at which cultures for suspensions should be used, to the time that has elapsed since the cultures were isolated from a host, and to other matters of this kind, I doubt but am unable to say. But of this much I am convinced, that we lack much obtainable knowledge about the abortion bacillus which must be secured before immunization against bovine infectious abortion can be lifted out of the experimental stage.

Until we have obtained more knowledge I am inclined to believe that it will be almost necessary, in order to immunize cattle successfully against bovine infectious abortion with injections of suspensions of the abortion bacillus, that the living, undisturbed cultures of the bacillus should be sent to the locality in which the injections are to be made, and that the suspensions should be made in that locality, or near by, and used before they are many hours old. But what the final outcome of immunization will be, or what is needed to make it an economically practicable thing, I do not fully know, and if anyone else has the lacking information I am sure that it has not been published through agencies that have reached me.

SAMPLES OF COMMERCIAL SUSPENSIONS OF BOVINE ABORTION BACILLI

To inform ourselves in some measure about the quality and character of the alleged suspensions of live abortion bacilli, prepared and marketed by biological concerns in the United States, Dr. Cotton and I procured twenty-four samples through the Virus-Serum Control Division of the Federal Bureau of Animal Industry, and applied four relatively simple tests to them.

First, we made a microscopic examination of cover glasses prepared directly from the suspensions; second, we made cultures from the suspensions on media suitable for the growth of the Bang abortion bacillus; third, we made a microscopic examination of the growth that was obtained on the culture media; and, fourth, we tested the suspensions relative to their sensitiveness to abortion-positive and abortion-negative blood-serum of cattle.

The suspensions from the different producers varied markedly in appearance; some were faintly and others heavily clouded; those from one producer were entirely clear but contained a heavy sediment; most of the containers showed some sediment; the dose varied from 5 to 20 cubic centimeters; the number of germs per dose was given in some instances but not in others; the return dates stamped on the labels were from two to three months later than the time at which the tests were made; consequently it can not be said that we were dealing with antiquated, out-of-date material; and the containers, as I have previously said, varied in shape, size and color.

The results obtained with the four tests are as follows:

Microscopic examination of cover glasses

Bacteria indistinguishable from Bang abortion bacilli	15
Slightly contaminated with other microorganisms	2
Grossly contaminated with various microorganisms, including streptococci and a large spore-bearing bacillus	7
Total number of samples	24

This simple test, if the presence of extraneous microorganisms in the two slightly contaminated suspensions is overlooked, requires the condemnation of 7, or 29 per cent, of the 24 suspensions.

Growth on culture media

Abundant growth, macroscopically indistinguishable from the growth of the Bang abortion bacillus	14
Very meager growth, macroscopically like the growth of the Bang abortion bacillus	3
No growth of any kind	1
Growth wholly unlike that of the Bang abortion bacillus	3
No cultures made because the microscopic examination of the suspensions showed so much contamination that cultures were deemed unnecessary	3
Total number of samples	24

If we omit the 3 suspensions from which no cultures were made, we have 1 that was worthless because it was entirely

dead, 3 that were worthless because they were nearly dead, and 3 that were worse than worthless because of the presence of a preponderance of extraneous microorganisms, or 7 among 21, or 33 1/3 per cent, that must be condemned.

If we add to the 7 the 3 that were found on microscopic examination to be too badly contaminated to require that they should be studied culturally, we have 10 among 24, or 41 13/20 per cent, of worthless suspensions.

Microscopic examination of growth on culture media

Microorganisms indistinguishable from Bang abortion bacilli	14
Same as above plus a few large cocci	3
Pure cultures of a large coccus	2
Miscellaneous assortment of bacteria	1
No growth of any kind	1
No cultures made because first microscopic examination of the suspensions showed excessive contamination	3
Total number of samples	24

This test absolutely condemns 3, or 15 per cent, of the 20 suspensions from which growth was obtained on culture media. Add to the 3 the 1 which failed to produce growth, and the 3 not cultured because of their gross contamination, and we have 7 among 24, or 28 per cent, of worthless suspensions.

Sensitiveness of suspensions to serum from abortion-positive and abortion-negative cows

Perfectly agglutinated by positive and not at all by negative serum	7
Poorly agglutinated by positive and not at all by negative serum	3
Poorly agglutinated by positive and more or less sensitive to negative serum	8
Suspensions containing so-called anti-serum, and which, therefore, could not be subjected to this test	6
Total number of samples	24

As this test was carefully checked with a standardized suspension of Bang abortion bacilli, regarding the quality of the positive and negative sera used, we may say, if we generously accept the 3 suspensions as satisfactory that were poorly agglutinated by positive serum but not by negative, that 8, or 44 4/5 per cent, of 18 are shown, let us put it mildly, to be of quite doubtful value.

We might stop here with the conclusion that the several tests show a pretty bad condition, bad enough to account for the contradictory and often wholly discouraging results that follow the use of commercial vaccines against bovine infectious

abortion. But as it is not entirely clear that the highest percentage of imperfect suspensions found with any one test is not the percentage found with all the tests, a few words more are required.

The suspensions which failed with one test are not in all cases those that were found to be imperfect with one or more of the other tests. For example, the one suspension that was found to be dead and the 3 that were found to be nearly dead with the cultural test were all 4 suspensions that were found to be perfect with the serum test, and, if we add these 4 to the 8 that were unsatisfactory with the serum test, we have 12, or 66 2/3, of 18 suspensions of very doubtful value.

Again, if we take the 6 suspensions that could not be subjected to the serum test because they contained so-called antiserum, and know that 3 were found to be so badly contaminated with the first microscopic test that it was believed unnecessary to test them culturally, and that 3 tested culturally produced a growth macroscopically and microscopically unlike the Bang abortion bacillus, we may add them to the 12 suspensions designated in the last paragraph as of very doubtful value, and this gives us 18, or 75 per cent, of 24 suspensions of a quality that would inspire no discreet or judicious person to inject them into valuable cows as immunizing agents.

The real fact of the matter is that only 5 of the suspensions were found to be perfect with all four tests, and that means that 19, or 79 18/100 per cent, of the 24 ranged in value from doubtful to positively worse than worthless.

The suspensions were the product of five different concerns, and, as I do not wish to leave you with the impression that any one concern is producing a bovine infectious abortion vaccine of unvarying excellence, I will tabulate the results shown by the tests applied to the six suspensions obtained from the producer who made the best record.

Satisfactory with all four tests	2
Satisfactory with three tests but shown to contain only a few living organisms with the cultural test	2
Satisfactory with three tests but shown to be practically dead with cultural test	1
Satisfactory with two tests but shown to be dead with the cultural test	1
Total number of samples	6

If dead abortion bacilli were immunizing agents, which they

have not been proved to be, the suspensions made by this concern would be admirable. One-third of its product has no value; another third is of doubtful value; and what the value of the last third will be before the return date, two months after the date of the tests, is reached, I will leave to your judgment.

The conclusion I draw from the data I have presented can be written in less than a dozen words, as follows:

Vaccination against bovine infectious abortion disease is in the experimental stage.

LANTERN SLIDES OF FOOT-AND-MOUTH DISEASE

Several sets of lantern slides dealing with the dreaded foreign livestock plague, foot-and-mouth disease, have been prepared by the Bureau of Animal Industry, United States Department of Agriculture. They are for educational purposes and for distribution to regions from which symptoms resembling the plague are reported. The United States has been entirely free from foot-and-mouth disease ever since the last outbreak, which was stamped out in 1916. The very fact that the disease does not exist makes the symptoms unfamiliar to livestock owners and even to many State and local officials and veterinarians. The slides, 22 in number, show various symptoms of the malady and methods of combating it.

Foot-and-mouth disease recently has been causing heavy losses of cattle in western Europe, and the Department of Agriculture has prepared the slides as one more means of aiding in the suppression of infection should it by any chance slip past the rigid quarantine maintained against it. Meanwhile, the showing of the slides before livestock owners should be beneficial in acquainting them with the seriousness of the disease and in obtaining their cooperation in the event of need to slaughter infected animals for the good of the nation's livestock industry. The use of the slides by responsible persons can be arranged for by application to the United States Department of Agriculture, Washington, D. C.

Dr. E. A. Watson has returned to Ottawa after a visit to the Veterinary Research Stations at Lethbridge, Alberta, and Agassiz, B. C., Canada.

CYST-FORMING PROTOZOA IN REINDEER AND CARIBOU, AND A SARCOSPORIDIAN PARASITE OF THE SEAL (PHOCA RICHARDI)

By S. Hadwen

Chief Veterinarian, Reindeer Investigations in Alaska, Bureau of Biological Survey, United States Department of Agriculture

REINDEER, especially the older animals, are very commonly infested with Sarcosporidia. It is quite usual to find numerous cysts in the esophagus and other muscles of reindeer killed for meat, which otherwise seemed to be in the best of health and condition. On the other hand in post-mortems held on diseased or aged deer it was often found that the muscles were extensively invaded. In some cases the meat was so altered that it could not have been passed for food. The distribution of Sarcosporidia throughout the body is uneven, certain parts being more infested than others. It is probable that the shape and size of the cysts may vary according to the tissues in which they occur, but the spores themselves also differ in size and appearance. Therefore the microscopical differences of both cysts and spores are briefly given and a new species is described under the name of *Fibrocystis tarandi*.

Sarcocystis of the Heart

In several post-mortems the endocardium showed a spotted appearance. The cysts were so numerous in some cases that the lining had a grayish look. When the muscles were teased apart, the cysts showed as transparent sacs which could easily be picked up on the point of a needle. The cysts averaged 0.433 mm. in length and 0.168 mm. in width. (Fig. 8, 1) This is less than the measurements of those found in the esophagus. The spores measure 16 microns in length by 7 microns in width and are larger than the esophagus form. The ease with which heart cysts can be isolated from the muscles is due no doubt to the histological structure of the fibers. When a little pressure is applied the cysts slip out easily. In the esophagus it is very different and the cysts often show a spiral appearance on section, being more firmly inclosed by the muscle

Fig. 1.—Pits in bone made by cysts of Fibrocystis tarandi. (X 2)

Fig. 2.—Cysts in periosteum. Fibrocystis tarandi. (X 2)

fibers. The heart cysts appear straight in outline but have small wrinkles on their surface.

SARCOCYSTIS IN THE ESOPHAGUS AND OTHER MUSCLES

The cysts look very similar to *Sarcocystis tenella* of sheep. The average length is 0.868 mm. and the width 0.137 mm. The longest cyst found was 2.25 mm. The spores measure 10 microns in length and 4 microns in width. (Fig. 8, 2.) In section from the esophagus the cysts tend to curl and often have a corkscrew appearance. On one or two occasions "rice grain" cysts resembling *Balbiania* were encountered. These showed the partitions which have been taken as a character separating this genus from *Sarcocystis*. Authorities are now mostly agreed, however, that the *Balbiania*-shaped cysts in sheep are due to *S. tenella*. The situation in which most of these cysts were found in reindeer was deep in the muscles, especially over the periosteum of the flat bones such as the scapula, where the muscles have a direct attachment. The spores from the *Balbiania*-like cysts seem similar to those of the esophagus and voluntary muscle forms.

FIBROCYSTIS TARANDI SP. N.

Reindeer owners have noticed an affection called by them "corn-meal disease" which attacks the deer in some of the herds. The appellation is on account of the granular nature of the lesions suggesting the gritty feel of coarsely ground meal. The cysts occur in the fibrous connective tissues, especially in the periosteum and on the surface of the tendons. (Fig. 2.) In a heavily infested caribou killed near Ophir, Alaska, all the bones examined showed cysts, even the mandibles. Where the bones were deeply covered by muscles, such as the tibia, the cysts were noticed only on the antero-internal side, which is only covered by the skin, and on the posterior aspect of the bone none were found. The cysts of the periosteum were mostly under the surface next to the bone, and after the periosteum was stripped off small pits were found in the cancellated tissue which corresponded with the position of the cysts adhering to the periosteum. The pits are undoubtedly the result of pressure. (Fig. 1.) The periosteum being nonelastic places the cysts under considerable strain. On the outside of the tendons similar pits were also noted.

Fig. 3.—Fibrocystis tarandi in periosteum. (X 9)

In reindeer the parasites seem to be identical with those found in the caribou. One case was discovered in a herd near the mouth of the Yukon, and a number of additional cases are reported from other herds. In the two cases which were examined the cysts were so numerous that the flesh was depreciated in value and could not have been sold.

The Cyst

The diameter of the cysts averages about 0.275 mm., the smallest being 0.1 mm., the largest 0.45 mm. They are generally round, but when several are packed closely together they may show flat sides or become elongate. The cysts have three coats, an outer, thick and fibrous, with a concentric arrange-

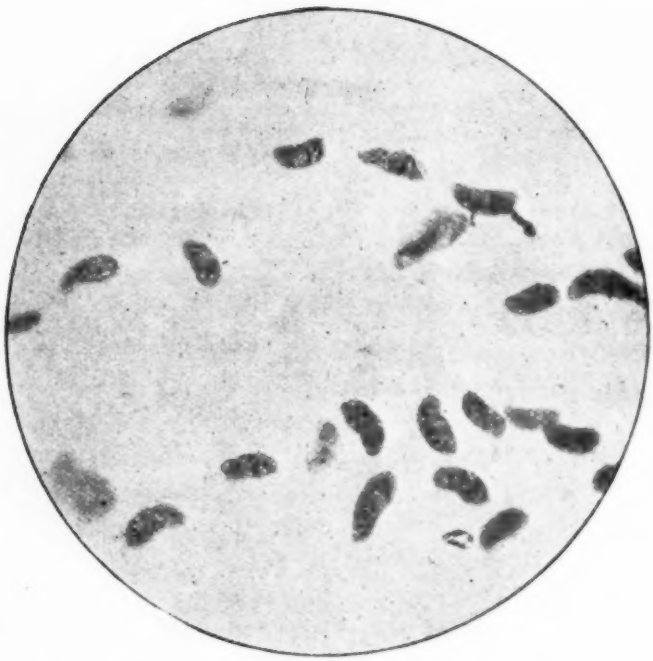

Fig. 4.—Spores of Sarcocystis of reindeer from heart muscle. (X 540)

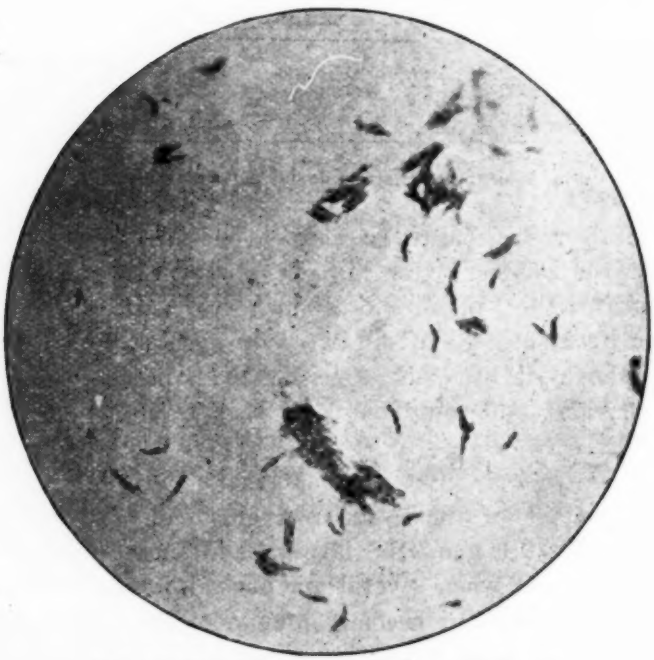

Fig. 5.—Fibrocystis tarandi spores. (X 540)

ment of fibers, a clear hyaline ring and an inner lining which surrounds the spores. (Fig. 3.) In having three coats the cysts differ from Sarcosporidia which have only one protective covering. If a piece of the periosteum is stripped off the bone and then is scraped, the cysts may come out of the outer shell which will be left imbedded in the fibrous stroma of the periosteum. The intermediate covering of the cyst is of a transparent nature and in the accompanying illustrations (Fig. 8, 4) they can be seen as clear rings surrounding the cyst. The cysts are apparently not attached to the outer coats by processes, as it is easy to free them. In unstained material the interior of the cyst is dark brown in color.

The Spore

In alcoholic material the average length of the spore is 7 microns and the width 1.75 microns. (Fig. 8, 3.) There is a well-defined nucleus which is nearly central. The spores are spindle shaped and do not show a polar cap like Sarcosporidia. Small granules occur in the endoplasma. In groups of spores which are packed together the arrangement is such that the nuclei of alternate spores form regular rows. The cyst formation and the shape of the spores recall the forms described by Gilruth and Ball from the intestine of the kangaroo. The name *Fibrocystis* is based on the location of the cysts.

THE PROBABLE EFFECT OF THE PARASITES ON REINDEER AND CARIBOU

The massive infections found in the two cases examined leave little doubt that the animals were adversely affected. The pits in the bones are suggestive of pain, and as the tendons and sheaths are likewise affected it is evident that if they undergo calcification they would cause trouble. It is probable that in addition to mechanical effects the parasites may also cause injury by their secretions and excretions.

SARCOCYSTIS IN SEALS (PHOCA RICHARDI), SARCOCYSTIS RICHARDI SP. N.

Two seals were examined in December, 1920, at Unalakleet, Alaska, and Sarcosporidian cysts were found in both animals. In one, the muscles of the diaphragm contained a number of long cysts. (Fig. 7.) The average length of seventeen cysts

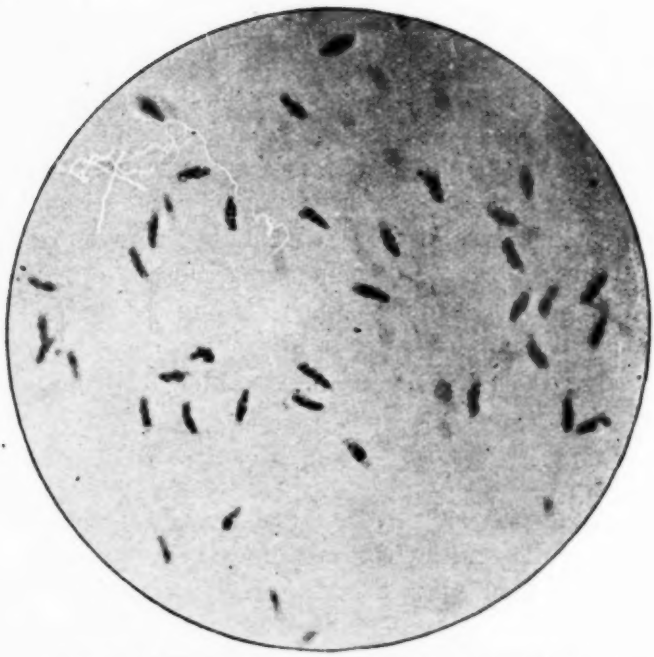

Fig. 6.—Spores of Sarcocystis richardi. (X 540)

Fig. 7.—Cysts of Sarcocystis richardi in muscles of diaphragm. (X 2)

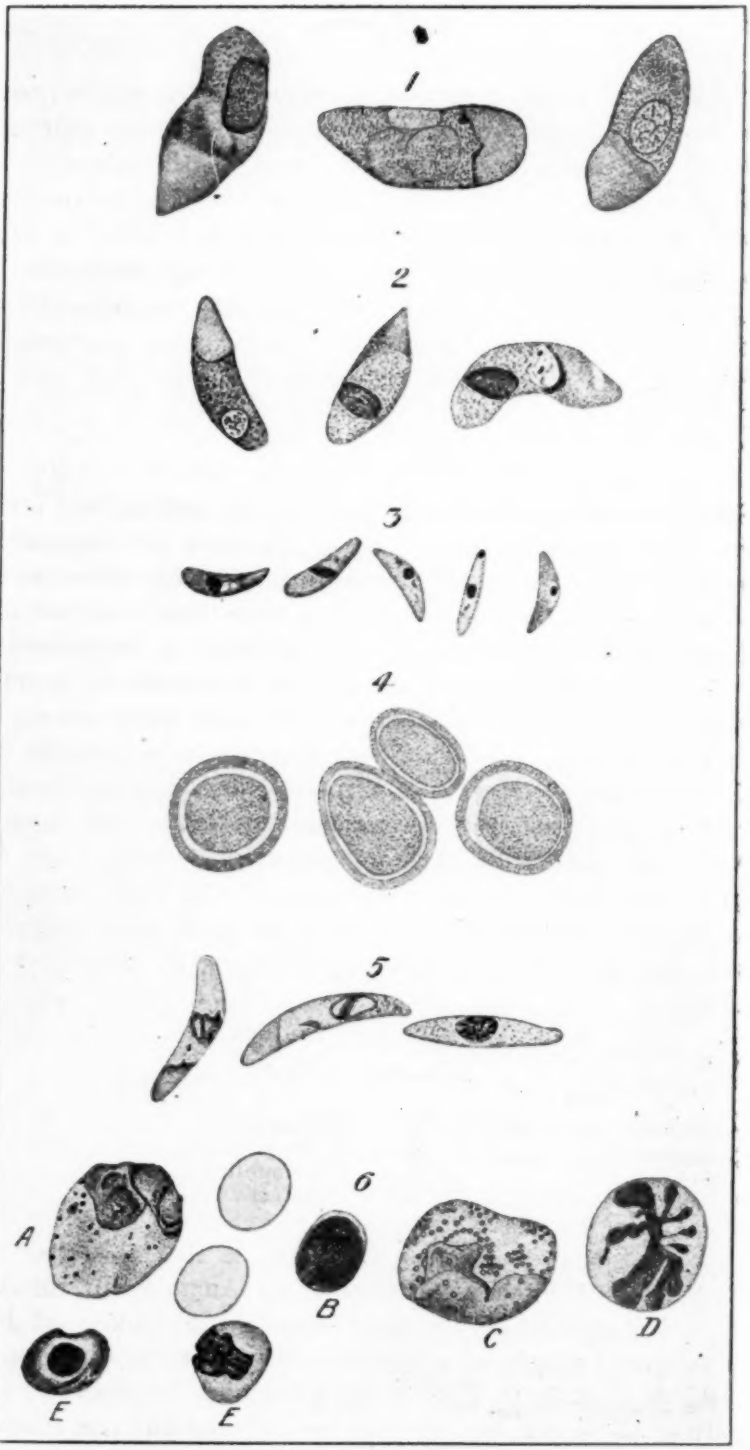

Fig. 8.—1, Spores from heart muscle. 2, Spores from Balbiania-like cysts. 3, Spores of Fibrocystis tarandi. 4, Cysts of Fibrocystis tarandi. 5, Spores of Sarcocystis richardi. 6, Blood from seal. A, Basophile; B, Lymphocyte; C, Eosinophile; D, Neutrophile; E, Nucleated red cells.

was 1.2 cm. The three longest measured over 2 cm. in length. The average length of the cysts at once suggests that they are different from those found in the domestic animals. According to Railliet, the longest cysts observed in cattle measured 1 cm. in length. Minchin says *Sarcocystis tenella* in sheep reaches a length of 16 mm. The spores average 10 microns in length by 2.5 microns in width. (Fig. 6.) As Sarcosporidia are classified largely according to their hosts, it seems warranted to suggest the name of *Sarcocystis richardi* for the seal parasite. (Fig. 8, 5).

SEAL BLOOD

Smears made from the heart blood of the seals showed a high percentage of eosinophiles. Large numbers of eosinophiles have been noticed in heart muscles infested with Sarcosporidia in other animals, and it is probable that these cells act in a defensive manner against them. In addition to Sarcosporidia, the seals harbored a large number of a species of *Acanthocephala;* perhaps the eosinophiles were more numerous on account of its presence. It is interesting to note that the seal eosinophiles have rather large granules which may be described as intermediate in size between those of cattle and those of horses. The mast cells have few granules and these are correspondingly large. In one of the seals (No. 2) there was a definite anemia. Nucleated red cells were noted with polychromania and punctate degeneration. Fig. 8 (6) illustrates the condition.

DIFFERENTIAL COUNTS

December 4, 1920

Seal 1		*Seal* 2	
Mononuclears	16	Mononuclears	48
Polynuclears	42	Polynuclears	23
Eosinophiles	38.5	Eosinophiles	16.5
Mast cells	3.5	Mast cells	12.5

Dr. A. W. Whitehouse, Professor of Anatomy in the Veterinary Department of the State Agricultural College at Fort Collins, Colo., who is on a year's leave of absence studying for the degree of M. R. C. V. S. at the Veterinary Department, University of Liverpool, has recently been offered and has accepted the position of Director of Studies and Professor of Anatomy at the Glasgow Veterinary College, Scotland.

SARCOSPORIDIOSIS OF SWINE, ASSOCIATED WITH ADVANCED DEGENERATIVE CHANGES IN THE MUSCULATURE

By G. T. CREECH

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IN PRESENTING this paper on sarcosporidiosis of swine it is the intention of the writer to record briefly certain observations that have been made in a number of cases of heavy sarcosporidial infections in swine, in which there were also well-marked alterations in the musculature of the affected animal, as encountered from time to time in the regular routine of diagnostic work at this laboratory.

Sarcosporidia, which were first observed in the muscles of mice by Miescher in 1843, are now known to be of common occurrence in the domestic animals; and notwithstanding their early discovery, little is yet definitely known regarding the life cycle of these microparasites. Smith (1) succeeded in transmitting sarcosporidia in mice by feeding infected muscle tissue. Nègre (2), whose experiments have been repeated by Crawley (3) with similar results, has proved that the feces of mice that have been fed with muscle tissue infected with sarcosporidia are infective for other mice between the fifteenth and sixtieth days after feeding. While transmission experiments in the larger animals have given either questionable or negative results thus far, yet the results obtained by Nègre and Crawley point to the possibility of herbivorous animals infected with sarcosporidia through the medium of herbage, water, etc., contaminated by the feces of carnivorous animals which have devoured infected meat, the parasites passing through developmental stages in the epithelial cells of the intestines of the host, involving the production of spores, which pass out of the body in the feces.

The frequency of occurrence of sarcosporidia seems to depend somewhat upon the particular species of animal affected. According to Minchin (4), sarcosporidia "are nearly always to be found in the pig and sheep." The observations made by zoologists in this country, particularly with regard to sheep,

tend to bear out this statement. As to the occurrence of sarcosporidia in pigs, Bergman (5) found 8,498 cases of sarcosporidiosis in pigs in Sweden out of a total of 27,751 animals. Neumann (6) states that sarcocysts in the pig "are very frequent—at least in certain countries and at certain periods." Though sarcosporidia may be especially common in sheep and swine, they are by no means rare in cattle and horses.

In the consideration of the frequency of occurrence of sarcosporidia it might be well to mention that in a large percentage of cases they occur only in limited numbers with no apparent harmful effects resulting from their presence in the tissues. Only those cases will be considered in this paper in which the parasites were present in large numbers in the muscle tissues and which were associated with well-marked pathological changes, particularly those of degeneration.

The encountering of so many cases in which the limited numbers of parasites present had caused no apparent alterations of the tissues has led certain investigators to the conclusion that sarcosporidial infections seldom result in damage to the invaded tissues. Edelmann (7) says: "The very fact that the presence of Miescher's sacs in the muscles does not irritate the latter, nor produce any symptoms of disease in the animals, would lead us to conclude that they are harmless parasites." Darling (8) in writing of sarcosporidia encountered in Panama states that according to his observations these parasites displayed little or no evidence of having induced any tissue reaction, and that sarcosporidial infection, though common, "probably has very little pathogenic significance or economic importance." He thinks that the reason so little light has been thrown on the subject of sarcosporidiosis is due to this more or less common view that sarcocysts are not pathogenic and are of doubtful economic importance.

There are others who hold similar opinions, notwithstanding the fact that literature records a number of cases in which the affected animals not only exhibited symtoms indicating muscular involvement, but on microscopical examination of the musculature of such animals well-defined pathological changes were noted, with excessive numbers of sarcosporidia present. Ostertag (9) and others describe cases of sarcosporidiosis, particularly in cattle, in which there were symptoms of lameness. Certain

muscular changes were noted on postmortem examination, and microscopically large numbers of Miescher's sacs were seen. In one of these cases there was paleness, loss of striations and granular disintegration of the muscle fibers.

Watson (10) describes symptoms and lesions of sarcosporidiosis in cattle and horses and concluded that "the parasite sarcocystis under certain conditions becomes a very important factor in disease, invading the entire musculature of its host, with serious or fatal consequences."

McGowan (11) found large numbers of sarcosporidia in European sheep affected with "scrapie" and believed them to be the cause of this disease. However, his findings have not been confirmed by other European investigators.

According to Minchin (4), sarcosporidiosis is sometimes the cause of fatal epizootics among domestic animals. He mentions paralysis of the posterior extremities as one of the symptoms of this condition in hogs.

Virchow (12) mentions feebleness, or intermittent paralysis, among the symptoms observed, in a number of cases of sarcosporidiosis of the pig which came to his notice.

Other authorities besides those mentioned are also of the opinion that sarcosporidia may at times prove harmful to their host, especially in heavily infected cases.

DESCRIPTION OF CASES EXAMINED

The cases of sarcosporidiosis in swine which have come under the observation of the writer have been confined largely to specimens of the so-called "soft" or "mushy" hams, more particularly cooked hams from meat-packing establishments in different sections of the country which have been forwarded by Government inspectors for a laboratory diagnosis.

Prior to cooking, these sarcosporidial hams, with an occasional exception, show only slight gross changes, such as a possible softening or flabbiness of the muscle tissue, which may also appear somewhat paler than normal. If the changes referred to are only slight they may be easily overlooked by the meat inspector in his routine inspections of the hams during the course of their preparation, and the "mushy" condition becomes apparent only after the affected hams have been subjected to the cooking process. Even after cooking, the true condition

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of the ham may not be detected until after it reaches the retailer, owing to the fact that boiled hams are frequently "boned" and wrapped, sometimes with cloth, which to a large extent precludes the possibility of detecting the "soft" condition until after the interior has been exposed through slicing, etc. Occasionally such specimens are returned to the packer and eventually reach this laboratory for a determination of the nature and cause of the softened condition.

These hams come from lots that have been cured and handled in the regular way, and this tendency of an occasional ham to "fall to pieces" has in the past been attributed to different causes, such as overcooking, etc. The process of disintegration is quite marked in some specimens. The muscle tissue of a number of the hams examined presented the appearance of having been passed through a meat chopper. In all the specimens of cooked hams that have been received there has been more or less variation in the extent of this disintegrated condition. The few uncooked hams that have been received exhibited a soft or spongy conditon of the muscle tissue and were quite pale in color.

HISTOLOGICAL APPEARANCE

Some fifteen cases have been examined histologically, and while it may be said that there were variations in the extent of the lesions and the number of parasites present, yet there were certain outstanding changes noted which were common to all. This refers particularly to the very marked degenerative changes, atrophy, etc., which were present in a greater or lesser degree in all cases examined.

In the first case examined difficulty was experienced in finding pieces of muscle still intact sufficiently large for sectioning. Sections from this specimen showed the musculature to be heavily infected with sarcosporidia. The parasitic invasion was accompanied by a myositis, the leucocytic infiltrations surrounding the degenerated parasites consisting largely of eosinophiles. There was also a very marked degeneration and atrophy of the muscle fibers (Fig. 1).

In other cases, in which there was a more extensive involvement of the muscle tissue in the degenerative process, practically all of the muscle fibers were affected, showing more or less dissolution of continuity, while many of the fibers had under-

Fig. 1 (Case 0054)—Inflammatory changes caused by sarcosporidia. The leucocytic infiltration surrounding the degenerated parasites consisted largely of eosinophile cells. (X62)

Fig. 2 (Case 2505)—Unusually well marked muscular degeneration, as evidenced by unstained portions of muscle fibers. (X62)

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Fig. 3 (Case 2558)—Extensive involvement of musculature in degenerative process. Note ruptured sarcocysts, contents of which are intermixed with fibrillar débris. (X62)

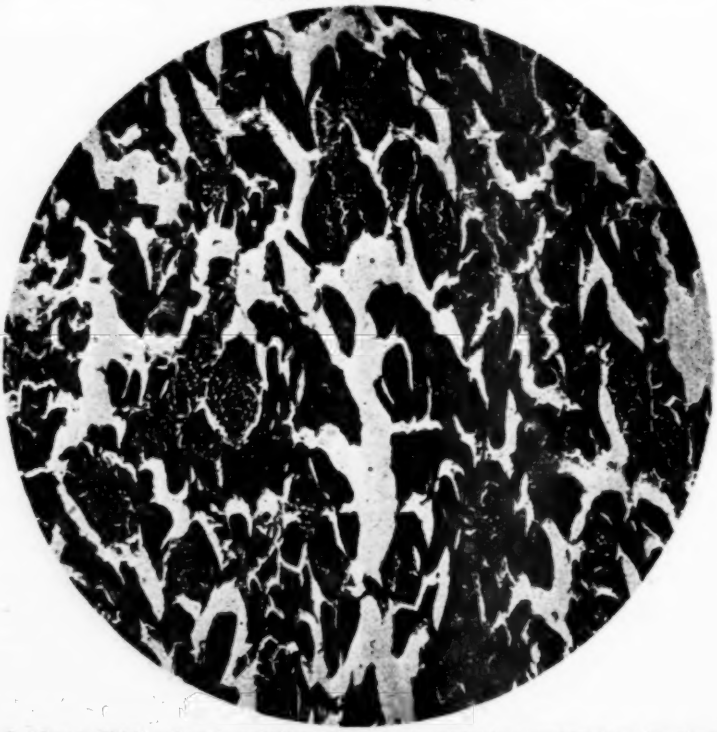

Fig. 4 (Case 7814)—Cross section of muscle showing extensive involvement of musculature, practically one-half of the muscle fibres having been

gone complete granular disintegration (Fig. 2). In a number of these cases the breaking up of the fibers had evidently been accompanied by the rupturing of many of the sarcocysts, the contents of which could be seen intermixed with the protoplasmic débris (Fig. 3).

In some instances the sarcocysts appeared to be in varying stages of development, showing little evidence of degeneration, while in other cases a large percentage of the parasites were undergoing degeneration, many of the cystic chambers containing only a granular detritus. In a few instances calcification was noted in the older lesions.

CAUSES OF ALTERATIONS IN THE AFFECTED MUSCULATURE

Authorities seem to differ somewhat in their opinions as to the effect produced by excessive sarcosporidial invasions of animal tissues. In all such cases there is doubtless at first a certain amount of irritation, but tissue reactions, as evidenced by inflammatory changes, were noted in only a very few cases. Consequently the question arises as to what caused the marked degeneration of the muscle fibers which was observed in all cases examined.

The opinion is held by some that sarcosporidiosis accompanies other conditions or diseases which have left the animal in a depleted condition, and that the parasitic invasion of the tissues follows as a natural sequence, because of the lowered resistance of the animal.

On the other hand there are authorities, some of whom have already been quoted, who are of the opinion that sarcosporidia are capable of inducing definite tissue changes in their host, not only because of their presence, but, according to some, the parasites secrete a toxin, which may prove very damaging to the tissues, particularly the muscles, and possibly the nervous system as well.

Laveran and Mesnil (13), following observations made by L. Pfeiffer (14), succeeded in obtaining a toxin from sarcosporidia of sheep which they called "sarcocystin." This substance proved to be very toxic for rabbits (a tenth of a milligram of the dried extract being fatal), and less so for other experimental animals. Their work has been confirmed by other investigators.

Minchin (4) says: "Many observations tend to show that

the dangerous effects of the sarcosporidian parasite are not caused merely by the disturbances which they set up in the tissues of the host, but are due to an active poison secreted by the parasite itself."

In most of the cases examined by the writer there was little evidence of tissue reactions; and while definite proof was lacking, yet it would seem reasonable to assume that the marked alterations noted in the muscle fibers may have been caused by some toxic substance slowly eliminated by the numerous sarcocysts present in the musculature.

FREQUENCY OF OCCURRENCE IN SWINE

Efforts to obtain information with regard to the frequency of occurrence of these heavily infected cases of sarcosporidia in swine have thus far met with little success. No definite data were obtainable from the larger packing establishments, which it may be said was due mainly to the methods of handling the hams at the time they are subjected to the cooking process, and to the fact that the lesions in some cases are not very noticeable in the gross specimen. Therefore it is not possible at this time to make even an approximate estimate of the actual number of hams so affected. From one small establishment it was reported that approximately from one to three "soft" hams were encountered out of every fifty. If it be conceded that this soft condition in hams is practically always associated with sarcosporidiosis, and should the above ratio prevail in the larger packing establishments, it would mean that a very much larger percentage of hogs harbor this parasite in excessive numbers than has been suspected heretofore.

IMPORTANCE FROM A MEAT-INSPECTION STANDPOINT

Smith (1) refers to several cases of sarcosporidiosis that have been observed in man, but there has been no evidence presented anywhere in the literature showing that sarcosporidia of the lower animals may be transmitted to man, either through the consumption of meat containing the parasites or otherwise.

Ostertag (9), in rendering judgment with regard to meat infected with sarcosporidia, says it has been proved that these parasites are of rare occurrence in man, and is of the opinion that, because of the fact of their occurrence in food animals,

"it can not be assumed that sarcosporidia can be transmitted to man by eating meat." The possibility of transmission of the parasites to man being rather remote, then the disposition of meat containing excessive numbers of sarcosporidia should depend largely upon its food value and the presence or absence of toxic substances. Ostertag and other authorities on meat inspection agree that in those cases of sarcosporidiosis in which the meat shows noticeable alterations, such discoloration, or a watery condition of the musculature, it should be considered highly unfit for food. Therefore, such meat should be excluded from the market, not only because of its appearance, but more especially because of its greatly diminished nutritive value. It is the opinion of the writer that beyond the consideration of the poor food value of such meat, the fact that in many such cases the muscle tissue is so thoroughly permeated with the sarcosporidia is sufficient to render the meat of such carcasses more or less noxious from a meat-inspection standpoint, more especially because of the possibility of injurious toxic products eliminated by the parasites.

CONCLUSIONS

According to observation made in the various cases examined there are certain alterations of the musculature, particularly degenerative changes, which always accompany heavy sarcosporidial infections in swine.

Owing to the nature of the lesions it can not be stated definitely whether such alterations were due to the excessive number of sarcosporidia present or to some other etiological factor. However, the writer is of the opinion that the possibility of deleterious effects resulting from toxic products which may possibly be eliminated by the parasites should not be overlooked.

Owing to the lack of proper data on the subject it is not possible to reach any definite conclusion with regard to the economic importance of sarcosporidiosis in swine. However, the somewhat limited amount of available information would seem sufficient at least to justify the conclusion that these advanced cases of sarcosporidial infection occur more frequently in swine, and cause more damage to the invaded host, than has heretofore been recognized.

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INVITATIONS TO WORLD DAIRY CONGRESS SENT OUT

Invitations to send delegates to the World's Dairy Congress, to be held in the fall of 1923, have just been sent by President Harding to the Governments of about 50 foreign countries. A united effort is being made by all branches of the dairy industry in this country to make the meeting a success. The United States Department of Agriculture is cooperating with the World's Dairy Congress Association in every way possible, and many department men are doing active work on committees in making preparations. The place of meeting has not yet been selected.

Eminent authorities from all parts of the world will take part in the program, which is designed to touch on every phase of the industry from production to consumption that will be of interest to the people of many countries. The selection of speakers and topics is in the hands of a general program committee, headed by L. A. Rogers, director of the dairy research laboratory of the B. A. I. The four-part program tentatively decided upon will embrace research and education, industry and economics, regulation and control, and national health.

A NOTE ON THE PERIOD OF INCUBATION IN HOG CHOLERA

By M. DORSET

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THE USE of large numbers of hogs for the production of hog-cholera virus has afforded a means, already utilized by some,[1] for improving our knowledge of the disease hog cholera. One of the features of that disease concerning which we have little precise recorded data is the period of incubation. It is true that we may find statements in the literature concerning the length of the period of incubation in hog cholera, but these statements are not always in agreement, and it is furthermore apparent that they are generally based upon field observations rather than upon closely controlled experiments. The true period of incubation is the time elapsing between infection and the appearance of symptoms, but since the time of exposure by contact does not necessarily coincide with the time of infection, we may be led to erroneous conclusions by field observations. It is also true that the period of incubation may be influenced by a number of factors, such as the mode of infection, the resisting power of the animal and the invasive power of the virus. Since the length of the period of incubation may be influenced by these and perhaps other factors, we must expect reasonably wide variations in field observations, and to a certain extent also even in carefully controlled experiments.

The purpose of this note is to present data concerning the period of incubation in a limited number of pigs exposed to hog cholera. The data were kindly furnished by Dr. W. B. Niles. The pigs used were all obtained from farms in the vicinity of Ames, Iowa, and before purchase careful inquiry was made to make sure that the pigs were from susceptible stock and that they had not been exposed to cholera prior to purchase.

All pigs were exposed to cholera by the injection of defibri-

[1] Craig and Whiting. Bulletin 173, Purdue Univ. Expt. Sta., March, 1914. Hoskins, H. Preston. Jour. Amer. Vet. Med. Assoc., vol. 49, No. 6, p. 817. Sept., 1916.

nated virus blood subcutaneously into the loose tissues of the flank, the dose being 5 c.c. in most instances. In a few cases only 2 c.c. was injected, but as shown by Hoskins[2] and repeatedly observed by us, such variations in dose are without effect upon the course of the disease.

The observations are summarized in the accompanying table.

RESULTS FOLLOWING INOCULATION OF 171 PIGS WITH HOG-CHOLERA VIRUS

Time of observation after injection	Per cent showing first rise in temperature	Per cent showing first visible symptoms	Per cent off feed	Per cent died or killed for virus[1]
2d day (48 hrs.)	2.3	0	0	0
3d day (72 hrs.)	26.0	2.9	1.7	0
4th day (96 hrs.)	48.5	50.8	11.2	0
5th day (120 hrs.)	11.8	30.4	60.0	0
6th day (144 hrs.)	7.1	14.0	17.0	1.2
7th day (168 hrs.)	3.5	1.75	7.0	47.6
8th day (192 hrs.)	0.6	....	2.35	11.7
9th day or later	....	....	1.2	33.5

[1] 5.8 per cent recovered.

Before undertaking a discussion of this table, a few words of explanation are desirable. This table has been prepared from the records of 171 shoats which varied from 50 to 70 pounds in weight. The first column is self-explanatory. The second column gives the percentage of pigs which first showed an appreciable rise in temperature on the various days of observation. This increase in temperature was not always sufficiently marked alone to indicate that the disease process had begun to manifest itself, but the temperatures recorded on previous days enabled the observers to note a distinct rise above the prior level on the days indicated. Column 3, which is headed "First visible symptoms," shows the percentage of pigs which exhibited the first visible signs of a departure from the normal state of health on the different days of observation. The symptoms consisted merely of slight sluggishness or "slowness" and slight loss of appetite. These physical examinations were made by men of long experience who were accustomed to examine these and other pigs daily for symptoms of disease, and the symptoms detected by them might have been overlooked by inexperienced observers. The fourth column includes pigs which, on the days indicated, took little if any food. It will be noted that the fifth column gives the percentage of the pigs that died or were killed on various days. This column is introduced merely to serve as a sort of index of the virulence of the virus. It

[2] Loc. cit.

is not intended to show that the virus was virulent enough to cause the death of more than 60 per cent of the pigs before the end of the eighth day, because a very large part of the pigs that are recorded as dead on the eighth day were killed so that their blood might be used in other work. On the contrary, the fact that 5.8 per cent of the pigs recovered indicates that the virus was merely of good average potency. This is emphasized by the fact that every one of the 171 pigs showed symptoms of disease after inoculation. The recovery of nearly 6 per cent (and this figure might have been increased had none of the pigs been killed) of 171 pigs, proved to be susceptible, certainly does not indicate excessive virulence.

With respect to the period of incubation in these pigs, it seems that the temperature alone should not be used as a measure, for, as already explained, the rises of temperature recorded in the table mean merely elevations above the average normal, and since the normal temperature of hogs is subject to such wide variations, we can not be sure that in any given case a rise in temperature may not have been due to some disturbing influence other than the virus of hog cholera. The temperature may, however, prove useful as an adjunct to the physical examination.

Adopting the time of the appearance of visible symptoms as the end of the period of incubation, we find from our table that the shortest period was three days, observed in 2.9 per cent of cases, while the longest period was 7 days (1.75 per cent of cases). In more than 95 per cent of the pigs the incubation period ended on the fourth, fifth or sixth days.

It is coming to be recognized that successful immunization of hogs against cholera is primarily dependent upon the employment of a good grade of potent virus, first by the serum manufacturer in hyperimmunizing his hogs and in testing his serum, and second, by the veterinarian who is administering the simultaneous treatment in the field. The suggestion is made, therefore, that careful observation of the period of incubation of the disease in pigs inoculated to secure virus for any of these purposes may assist manufacturers in maintaining a virus of high grade.

The data here reported suggest that a virus which, after subcutaneous injection, causes visible symptoms in any considerable proportion of pigs before the fourth day is probably either of

exceptional virulence or that it is contaminated. In either case it may cause the death of hogs that are hyperimmunized with it. The early symptoms may of course result from prior infection with the virus of cholera or with other disease-producing agents, but even in such an event the use of the virus produced by pigs which sicken before the fourth day may prove disastrous.

Our table also suggests that to obtain the best results, *i. e.*, the most potent serum, an adequate test of the serum and a virus that will confer a lasting immunity when used simultaneously with serum, the virus used for these purposes should produce the first symptoms of disease on or before the sixth day. It is of course true that slow development of the disease may be caused by exceptional resistance of the pigs, but we then merely transfer the fault from the virus to the pigs, for it can not be maintained that exceptionally resistant pigs are suitable for the production of virus or for the testing of serum.

It is believed that hog-cholera virus which will produce visible symptoms and a rise in temperature in 50 per cent or more of susceptible pigs on the fourth day after subcutaneous injection, and which has the power to cause progressive disease so that a considerable majority of the pigs are "off feed" on the fifth day, will produce good serum, will give a reliable serum test and will result in a lasting immunity when properly administered with anti-hog-cholera serum. It is questionable whether a virus which does not, after subcutaneous injection, produce symptoms of disease in the great majority of susceptible pigs before the seventh day is fit for use in producing or testing serum or in administering the simultaneous treatment.

We are just in receipt of a copy of a report of the Australian Veterinary Association which was forwarded through the kindness of M. Henry, the Secretary. It is interesting to note in the proceedings that one of the speakers, Professor H. A. Woodruff, M. R. C. V. S., reports that the American Veterinary Medical Association "has been an inspiration to so many of us in the formation of this body, the Australian Veterinary Association."

AVIAN TUBERCULOSIS [1]

By A. F. SCHALK

Veterinarian, North Dakota Experiment Station

TUBERCULOSIS in its general application is pre-eminently the "watchword" of the hour in the animal-disease world today. Never before in history has any animal-disease condition been given such widespread publicity, the systematic propaganda and the financial support for its control and suppression as is accorded to animal tuberculosis at the present time. The motive is humane and unselfish. The endeavor is earnest and sincere, and the results, I firmly believe, will be the goal we have set out to accomplish, i. e., the ultimate eradication of this dreaded disease.

Alongside of this tremendous problem in animals, its sister disease, avian tuberculosis, is springing up with alarming rapidity in fowls, particularly in our northern country.

The nation's annual poultry production is valued at slightly less than $1,500,000,000. Since this produce constitutes one of the most nutritious and dependable commodities of human food, and avian tuberculosis is making great inroads into the industry in many localities, it might be well for us as sanitarians to give this disease most serious consideration in connection with tuberculosis in cattle and swine.

As a matter of history, avian tuberculosis has not been investigated until quite recently. Most researches have been conducted since the beginning of the present century. It is quite evident that the disease has been present in European countries for a long time, but it was not recognized or even suspected. As late as 1868 Villemin, perhaps the hightest authority of the time on tuberculosis, wrote: "Nothing is more problematic than the existence of tuberculosis in birds."

The caseo-necrotic lesions in fowls which are now known to be tuberculosis were variously ascribed to parasitic afflictions and to molds which had entered the air sacs, and were called lympho-sarcoma, tuberculo-diphtheria, or that vague and noncommittal term "scleroma."

Tuberculosis in chickens was reported for the first time in

[1] Presented before the twenty-fifth annual meeting of the Minnesota State Veterinary Medical Association.

our country in 1896 by Bray of Kansas. As no tubercle bacilli were found and the diagnosis was based on the general appearance of the lesions, we generally look to Pernot of Oregon for the first authentic description of the disease on our continent. In 1900 he reported several outbreaks in which the organisms were demonstrated and the gross lesions fully described. The disease was known to exist in European countries before the discovery of the Koch bacillus, both in poultry and in the aviaries of the large zoological gardens. The London Gardens alone showed a 30 per cent infection of 500 dead birds examined over a five-year period, and Koch and Rabinowitsch reported from the Berlin Garden 459 dead birds from 1903 to 1905, of which 27 per cent were affected with tuberculosis.

DISTRIBUTION AND ECONOMIC IMPORTANCE

Evidently the disease today is extremely widespread, as it is reported from all countries where the poultry industry forms a part of agriculture. Apparently it has spread alarmingly and extensively in certain sections of the United States during the last few years.

Our own State of North Dakota illustrates this point fairly well. The records show that the first tuberculosis in fowls in the State was reported in 1907, and as late as 1911 and 1912 our laboratories at the Agricultural College received less than one tuberculous specimen per month. The condition has steadily increased until during the last two years more than 100 fowls which were found to be tuberculous have been presented annually for diagnosis. Even these figures do not represent the actual conditions, as meanwhile hundreds of poultry owners have been directly informed and thousands more have been made more or less familiar with the disease through bulletins, circulars and other educational agencies.

Indications are that many other States are experiencing similar increased infections; for example, California, Washington and Oregon of the Pacific Coast, and Montana, Wisconsin, Minnesota and New York of the northern border and several of the Corn Belt States.

The economic importance of the disease in such highly infected States is becoming considerable. We should not only judge from the actual number of fowls which annually die from the disease, but should take into consideration the tremendous

loss of poultry flesh as the result of the wasting nature of the disease. In the large henneries of some States it has been known to decimate from one-fifth to one-third of the flock. Consequently the losses at present mount into the millions annually.

During the past winter and spring one of our practicing veterinarians applied the intradermic test to more than thirty flocks in his territory, and this revealed tuberculous fowls in about 90 per cent of the flocks, in which the degree of flock infection ranged from about 2½ to 65 per cent. This being true in one vicinity, you may well ask yourselves what is the situation in your own community. The condition is well worth investigating.

CAUSES—THE AVIAN TUBERCLE BACILLUS

It is generally accepted that the avian strain of the tubercle organisms causes an overwhelming majority of cases of fowl tuberculosis. Although some authorities state that from 6 to 10 per cent of the infections are due to the mammalian types, most investigators are of the firm opinion that practically all tuberculosis in birds, with the exceptions of parrots and canaries, are the result of the avian strains. The avian type differentiates itself from the human and bovine strains principally by being more easily isolated and more readily cultivated in pure culture on artificial media. As a rule the avian bacilli are shorter than the human and more narrow than those of the bovine strains and stain more uniformly than both mammalian types, but these characteristics can not be relied upon as dependable and substantial bases for differentiation.

The marked differences in the pathogenicity of the two forms are apparently of vastly greater importance. While some workers regard the two forms of bacilli as distinct species, and consequently look upon avian and mammalian tuberculosis as two etiologically distinct diseases, there is weighty evidence at hand pointing toward a close relationship between these two forms of bacilli.

Parrots kept in houses for pets show as high as 50 per cent of infection with the human type of organisms, whereas in aviaries the avian type prevails in most cases. Upon experimental feeding and inoculations this species shows least susceptibility to the avian type, showing a higher preference for the mammalian tubercle germs. Many investigators have repeatedly failed to produce tuberculosis in the common fowl and

the pigeon with the human type of bacilli. Among the mammals which can contract tuberculosis from the avian bacilli are mice, rats and rabbits living in poultry houses. Quite a few spontaneous outbreaks of tuberculosis in mice have been reported as being caused by the avian germs, and it has been proven that field mice in particular are very susceptible to avian tuberculosis.

Of all domesticated farm animals it appears that swine are the most readily infected with the avian organisms. The disease has been produced in swine by both feeding and inoculating methods in which infected avian material was used. Mohler and Washburn experimentally induced it in hogs in 1909 and at that time pointed out the probable dangers of allowing swine to feed upon the carcasses of tuberculous fowls. Further, tuberculosis has been observed many times in swine by the Griffiths of England and Christiansen and others on the Continent in cases in which the avian organisms were the etiologic agents.

While the foregoing data show that hogs can and do contract the avian type of the disease, nearly all investigators state that it is practically all localized and very rarely spreads farther than the neighboring mesenteric lymph glands. The remaining animals appear to possess a relatively high degree of immunity in spite of the fact that two cases of avian tuberculosis have been found in horses and a few calves have been infected experimentally. The guinea-pig shows a remarkably low degree of infectivity to the avian disease. Large intraperitoneal injections will cause death, but presumably from an acute toxemia. Guinea-pigs can not be infected by inhalation, and very rarely by feeding. It is quite generally conceded that the avian bacilli do not present any serious danger to the human race.

Until quite recently the term avian tubercle bacilli has been associated with Johne's disease of cattle and lupus of man. It is now definitely known that there is no relationship between them whatever. Some investigators have gone so far as to attempt to diagnose Johne's disease by means of avian tuberculin. The results are very irregular and unreliable.

SUSCEPTIBILITY OF VARIOUS FOWLS AND BIRDS

The common fowl (chicken) is the principal sufferer, but other birds living with it do not escape. Turkeys, guinea fowls, peacocks and hand-reared pheasants are very often found in-

fected. Ducks and geese, though much less susceptible, are occasionally attacked. Pomay found upon a very heavily infected farm that 80 out of 98 turkeys were diseased, but not a single duck or goose, though ducks and geese were mingling with the turkeys. Thus it appears that ducks and geese usually escape under conditions of domestication, but they do not enjoy complete constitutional immunity.

Among the other birds which fall victim to the disease, especially in captivity, are parrots, canaries, pigeons, swan, owl, vulture, goldfinch, partridge, and practically all birds held in zoological gardens and aviaries.

Koch and Rabinowitsch in 1907, after investigating the birds of the Berlin Zoo, said that "in all probability every species of bird is liable to tuberculosis." However, the disease is extremely rare in the wild birds living under natural conditions. Therefore we can perhaps apply Dr. Philips's aphorism on human tuberculosis to the disease in fowls, that "it is a vicious by-product of an incomplete and ill-formed civilization."

DIFFERENTIAL DIAGNOSIS

From symptoms only it is very difficult and in most cases impossible to differentiate the disease from certain other affections, such as lymphadenoma and sarcoma of the liver, asthenia, nodular tæniasis and the air-sac (*Cytodites nudus*) disease, as well as certain nutritional disturbances. Therefore in many instances it requires a most careful examination in order to arrive at a positive diagnosis. Upon postmortem examination properly stained cover-glass preparations from the tubercles invariably reveal the presence of tubercle bacilli, and a positive diagnosis in the dead fowl is usually a comparatively easy task.

FLOCK INFECTION DISSEMINATION WITHIN THE FLOCK

Apparently the spread of tuberculosis within a flock is more extensive and rapid than that encountered in mammals. However, the close contact and large numbers of birds in more or less confinement largely account for this condition. As in other transmissible diseases, the spread of tuberculosis takes its start either directly or indirectly from a diseased bird. Tubercle bacilli can not under ordinary conditions grow outside the body of the animal. Avain tuberculosis is no exception to this rule, and when it is encountered in a flock its presence is due to an introduction of the infection from without. From its alimen-

tary involvement large numbers of bacilli are frequently found in the droppings, therefore the presence of infected fowls in a flock usually means the distribution of great numbers of bacilli through the feces. The long winters and long periods of housing of fowls in our part of the country, together with the absence of proper poultry-house sanitation, apparently account for a large per cent of our flock infections. The overcrowding and feeding off ground and floors which can be grossly contaminated by one or more infected birds is without doubt a prominent contributing factor.

TRANSMISSION FROM FLOCK TO FLOCK

There is but little doubt that the diseased bird is the important agent in the spread of the disease from flock to flock. The sale and exchange of birds is almost sure to result in bringing in the disease. When we consider the numerous possibilities open to infection of show and sale birds placed in the local cages, which are rarely thoroughly disinfected, we do not wonder that such fowls bring back the disease to the home flock.

Again, the pigeon and the English sparrow in their frequent visitations to the poultry yards for feeding purposes, together with their migratory proclivities to neighboring farms, are highly probable means of spreading the tubercle germs, both through their droppings and by mechanical means, such as feet and feathers.

Pernot of Oregon, Mohler and Washburn of the B. A. I., Higgins of Canada, and Koch and coworkers of Germany have shown the presence of tubercle bacilli in some of the eggs of infected birds. Although the number of infected eggs is apparently very small, it may be sufficient to bring infection into a healthy flock, by way of eggs for hatching purposes. Koch and Rabinowitsch infected a number of fertile eggs with avian tubercle bacilli. They were incubated, but only one hatched. The chick died of tuberculosis in 75 days in spite of the fact that it had been kept as free as possible from contaminating influences.

THE NORTH DAKOTA SITUATION

A tremendous amount of infection exists within our State. Many flocks are infected where the birds are not exhibited or shown and where no new stock is brought in and where there is no buying or exchange of eggs for hatching purposes. These

conditions bring out the fact that the carrier problem in this disease is even more unknown and unsolved and more mysterious than that encountered in many other infectious diseases.

Inasmuch as common mice are fairly susceptible to avian tuberculosis, and many spontaneous and natural infections in mice have been caused by the avian bacilli, is it not possible that these animals are much more implicated in the spread of the disease than we have accused them in the past? Mice not only migrate from farm to farm of their own free will in quest of food or possibly for other reasons, but a large number of mice are actually transported in hay bales, grain bags and feeds and forages in general which are carried from one farm to another.

Another possible carrier and one which is almost wholly overlooked is man in his various activities. At the majority of farmsteads the poultry is allowed to run at large, but mostly confine themselves to the runways immediately adjacent to the farm buildings. Under such conditions diseased birds deposit their infected feces anywhere and everywhere. The various members of the family can and do step upon these droppings and can readily carry them to their neighbors. Again, the farm vehicles, and especially those which the fowls use for roosting purposes, can serve as most potent carriers to the neighboring farmyards.

CHARACTERISTICS OF THE DISEASE

Poultrymen and persons not familiar with the disease refer to it variously, such as "lighters, "going light" and "spotted livers." These are all fairly good terms, as almost every case of tuberculosis in fowls is represented by one or more of these characteristics.

Avian tuberculosis is to be classed as a disease of the abdominal cavity and organs rather than of the pleural cavity. The constant occurrence of the tuberculous lesions of the liver, spleen, intestines and peritoneum of fowls indicates in a rather definite way that the infection is of alimentary origin.

Birds showing visible symptoms of the disease are invariably old birds, i. e., they have passed through at least one or more winters. It is extremely rare that we find the disease during the summer and fall in chicks hatched in the spring of that

same year. However, on experimental feeding it has been shown that young chicks are easily infected.

PHYSICAL SYMPTOMS

Under natural conditions it requires a rather long period, usually months, for the disease to become apparent. The physical symptoms and external manifestations are often slow in cropping out. However, the fowls usually begin by showing droopiness and drowsiness in disposition. They progressively emaciate and "go light," and often the birds show less than one-third of their normal weight in time. Anemic conditions usually prevail and are evidenced by a paleness about the head, comb, wattles and visible mucous membranes. A number of the fowls show a tendency toward lameness, and not infrequently confuse tuberculosis of the feet with the common condition known as "bumble foot." The latter condition is a necrotic involvement of the pad of the foot which may extend up the leg some distance. The tuberculous lesions are confined more closely to the lower joints and rarely rupture through the skin. One condition is sometimes found complicating the other in the same foot.

The birds soon become weak and in the course of the disease they are unable to mount the roosting perch. This weakness causes them to sit about on the ground the major portion of the time, and when roused they walk away languidly only to settle back on the ground again from exhaustion. Occasionally a bird is found dead on the nest or drops dead from the roost. In the last stages the feathers become dull and ruffled. The appetite usually remains very good and they often eat ravenously until a few days before death.

AUTOPSY FINDINGS

In the lesions of fowl tuberculosis caseation is the prevailing and predominant condition. The softening and liquefying stage so commonly met with in man and some other mammals is extremely rare, and calcification very seldom occurs. In hundreds of tuberculous fowls presented at our laboratories the writer recalls only a few instances in which calcification was present. This was found in the liver, in which the lesions approximated grains of sand in size and in which the calcification was apparently complete.

While the lesions are widely distributed, they do not as a rule vary as greatly as those found in infected mammals. They range in size from a pin point to that of a pea, hazelnut and even a small black walnut. Although the lesions appear small in comparison with those found in animals, they are relatively larger when we take into consideration the comparative sizes of birds and animals. In turkeys in particular the lesions show a great tendency to become confluent in the liver, where they often take on enormous dimensions, becoming as large as a pigeon egg or larger, and the liver may become three times its normal size. Again in many instances in common fowls the liver shows but little increase in size and the tubercles remain miliary with little or no inclination to become confluent.

Of all organs the liver shows the highest percentage of infection, with the spleen, intestines, mesentery and lungs being affected in the order named. A few foreign investigators report an exceedingly large number of lung lesions, but our own findings place them about parallel with those found in the kidneys. In the spleen the lesions simulate those of the liver in nature and consistency and are almost as frequently met with as in that organ.

The alimentary tract may be affected anywhere from the mouth to the cloaca, including the crop, esophagus and gizzard, but the lesions are most common in the intestines. Here the tubercles become multiple, building one upon another somewhat resembling the characteristic pearl disease common to ruminants.

Two theories prevail as to the development of the intestinal lesions:

1. That they have their origin in the villi of the mucous membrane, whence they extend outward through the intestinal wall, leaving only a scar in the mucosa, or a communicating fistula with the lumen of the intestine.

2. That the bacilli pass through the intact mucous membrane and set up primary lesions in the lymphoid tissues in the intestinal wall. In the development of the tubercles they may extend outward, where they become multiple, forming a conglomerate mass of nodules just under the serosa which often takes on large dimensions. At the same time the tuberculous process may make its way inward where it opens into the intestinal lumen.

These intestinal lesions, which can readily cast their contents directly into the ingesta and feces, together with the bacilli which are excreted by diseased livers via the bile, constitute the principal sources of fecal contamination as frequently evidenced in the droppings.

In the kidneys the nodules are miliary in nature, almost ivory white in color, and rarely become confluent. We have in a few instances demonstrated the bacilli in the excess of uric acid in the congested renal tubes when the tubercles were entirely absent.

The skin lesions as ordinarily observed are confined mainly to the featherless parts of the body, such as the eyelids, nasal openings, root of the beak, and the skin of the feet and legs. In the latter places they often occur as warty outgrowths of the skin, but not infrequently they complicate the joints, setting up a deforming arthritis which accounts for the so-called "rheumatic condition" and lameness which is encountered as a clinical manifestation of the disease. More detailed examination in advanced cases occasionally reveals lesions at the roots of the feathers. It is quite possible that lesions in the carcass skin are much more common than supposed, as most observations are made upon the internal organs and those portions of the exterior which are free from feathers.

In deep constrast to cattle and hogs, the lymph nodes are relatively free from lesions; however, there is an anatomical reason for this, as the lymph nodes or glands are but slightly developed in fowls.

Not all tuberculous fowls show macroscopic lesions. There are some birds which bear all the symptoms and external signs of the disease which when examined postmortem fail to present visible lesions. We encountered this condition quite often in our own laboratories some years ago when working with the intradermic test. Some birds showed typical positive reactions, but when opened were lesionless. Microscopic smears made from the pulp of the liver and spleen revealed the presence of acid-fast organisms which we interpreted to be tubercle bacilli. A few of these cases showed the tissues fairly swarming with the organisms, while in the majority of them the number of bacilli was moderate and limited.

Such conditions of tuberculosis are said to be caused by what is known as the "Yersin type" of bacilli. They multiply more

or less in the tissues but show no inclination to colonize and produce tubercles. The ordinary bacilli which produce lesions are known as the "Villemin type," which is the type most often met with in both animals and fowls. It is necessary that we mention this lesionless factor, as it helps to explain some of the apparent failures of the intradermic test, and therefore should be reckoned with in connection therewith.

Since this lesionless condition has been encountered in typically positive reacting fowls and the diagnosis has apparently been confirmed by demonstrating acid-fast organisms in microscopic smears made from the liver and spleen tissues of such birds, the thought of a similar condition existing in cattle suggests itself. During the last few years the B. A. I. workers have been able to find acid-fast germs in a large number of lymph nodes obtained from positive reacting cattle which presented no visible tubercles on postmortem examination. Is it not possible that the "Yersin type" of the bacilli is responsible for at least a part of these cases? We believe the condition warrants further consideration and investigation.

DETECTION AND DIAGNOSIS

Usually it is not very difficult for one to arrive at a correct diagnosis and render a reliable opinion in regard to this disease. When we gather the history of fowls "going light," becoming anemic and showing paleness about the head, and manifesting weakness by sitting around on the ground, we can almost be sure that such fowls are affected with tuberculosis. However, in some cases where the symptoms are less patent, it is advisable to slaughter a sick bird and make postmortem examination where the presence or absence of the "spotted livers" and other characteristic lesions will either confirm or deny the presence of the disease.

THE INTRADERMIC TEST

Lastly, we have access to the intradermic test, which, if applied correctly, can be relied upon as a very dependable diagnostic measure. For this purpose it appears as though tuberculin made from the avian strain is slightly more efficient than the mammalian product. While many have used ordinary mammalian tuberculin on fowls with gratifying results, the fact remains that those who have made comparative tests with both tuberculins report a larger percentage of reactors with the

avian product. It is quite reasonable to presume that tuberculin made from the specific type of bacilli would in the end be more satisfactory. However, it might be well to suspend judgment upon this phase of the question awaiting further data.

The tuberculin is best administered by means of a 26 or 27 gauge needle, the same type that is commonly used for intradermic work in cattle and swine, except slightly smaller in caliber.

Either wattles or comb can be selected for the seat of injection, but the wattle offers the best opportunities for the most satisfactory results. Frequently, and especially in the winter season, the epidermal layer of the comb is crumbly, friable and brittle, which renders it very undesirable. The flat side surface or the free ventral border of the wattle seems to be equally suitable. The operator grasps the wattle with the thumb and forefinger of the left hand, and with the syringe held firmly in the right hand, the needle is carefully inserted into the wattle as superficially as possible. An attempt should be made to lay the tuberculin (2 or 3 minims) just beneath the epidermal layer or as near it as possible. The raising of a white blister, about half pea size, at the point of the needle, the result of pressure necrosis, is an indication of an ideal injection.

A positive reaction is manifested by the presence of an appreciable local swelling at the point of inoculation, much like that observed in cattle, in which there appears to be a considerable degree of variation in the intensity of the reactions. They range from split-pea size swellings at the point of inoculations to thick, diffuse, edematous enlargements which sometimes take in the entire wattle and occasionally extend to the opposite wattle. The reaction swelling may begin to appear in from 12 to 15 hours or even earlier, and many reach their full development at 24 to 36 hours. However, when only one reading is made, 48 hours after the injection is perhaps the best time. While a few reactions may show best at 72 hours, a large majority of them begin receding after 48 hours.

PREVENTION AND ERADICATION MEASURES

Acknowledging the fact, which also prevails in many other infectious diseases, that all is not known pertaining to all the possible means of dissemination and the carrier problem in

fowl tuberculosis, we are not in a position to lay down absolute and air-tight measures for its prevention and control. However, reasoning from the basic knowledge which appears well established relating to this disease, we believe the following specific regulations and general sanitary precautions, if diligently applied and conscientiously adhered to, will keep this increasing disease well within reasonable economic bounds:

1. Provide proper hygienic conditions in the poultry house, a roomy house with plenty of south frontage windows and adequate ventilation. The layman is too prone to believe that cold air means fresh air, which is not necessarily true. Make provision for separate apartments for roosting and feeding activities. Both apartments should be cleaned of litter at least once a week, so as not to compel the birds to wallow and feed in their accumulated filth which may be contaminated by the infected droppings of one or more diseased birds. The long-continued confinement of a large number of our northern flocks in cramped quarters, illy ventilated, with practically no sunlight and in many instances under the complete absence of sanitation, are surely ideal predisposing factors for tuberculosis as well as many other poultry diseases.

2. Keep close watch on the flock for dumpy, weak, pale, lame and large-jointed birds. As soon as they appear destroy them or isolate them from the flock.

3. If postmortem examination of the destroyed bird reveals the disease, this is an indication for the tuberculin test to be made upon the entire flock to determine the degree of flock infection.

4. In case of heavy flock infection of scrubs and grades, advise the slaughter of the entire flock of the old birds at the close of the spring laying season, and keep only young fowls the coming year.

5. If the degree of infection is small and neglibigle, destroy immediately all positive and suspicious reactors and thoroughly disinfect the poultry house, pens and immediate runways, advising a retest the following year.

6. Where purebred flocks are maintained in which valuable blood lines are involved, the tuberculin test and a method of control along the Bang system can be instituted and carried out with success and economy.

7. In the purchase of new stock, buy purebreds only sub-

ject to the tuberculin test and from known healthy flocks, in so far as this is possible.

8. Since it is possible to transmit the disease by way of the eggs of tuberculous hens, purchase and exchange eggs from healthy flocks only, if such can be determined beforehand.

9. As the carrier problem is a very uncertain factor at the present time, perhaps we can do no better service than to advise along general lines in accordance with tuberculosis in mammals. I refer to the control of fowl droppings and particularly the avoidance of carrying them to neighboring farms on shoes and farm vehicles and implements, and also the suppression of pigeons and sparrows and the destruction of mice and rats harbored about the poultry houses, which are probable carriers of the disease.

10. All tuberculous fowls, as well as the offal from birds used for the table, especially if obtained from outside sources, should be destroyed, preferably by complete burning.

11. Further, it is highly advisable to cull out all old fowls not desired for breeding stock before winter sets in. This plan not only eliminates possible diseased birds which otherwise would be harbored with the well fowls during our long winters, but, owing to the fact that old hens are less profitable from the production viewpoint, such a policy would be in accordance with good poultry husbandry.

12. Thoroughly disinfect the poultry house, pens and eating and drinking utensils from time to time, and in case of severe infections in fowls kept under close confinement, abandon the old breeding and rearings grouds for a year or more.

CONCLUSIONS

It appears from the available literature on this subject that, with the exception of the intertransmissibility of avian tuberculosis between fowls and swine, the disease in fowls stands out almost alone with its problems of hygiene and economy.

We will grant that such a conclusion is quite tenable, as based on our present knowledge of conditions. However, inasmuch as the researches on this phase of the tuberculosis problem have been relatively few in number and some of them more or less limited in scope and extent, one may raise the point of the need of further and more comprehensive and detailed investigations upon the further intertransmissibility of tuberculosis between fowls and mammals.

FORAGE POISONING [1]

By CHARLES W. FISHER
Danville, Kentucky

FORAGE POISONING is a term applied to a number of animal diseases which are supposed to be caused from poisonous feed. Of late, however, we connect the term forage poisoning with botulism. In our opinion botulism should be identified as such and leave the term forage poisoning to apply to the other diseases, such as cases due to fungi or acrid substances in the feed, either dry or pasturage. Possibly cornstalk disease and cottonseed meal poisoning should come under this head until we have learned more about them. Poisoning due to specific and well-known poisonous plants, such as hemlock, loco, larkspur, lupines, etc., should be classed not as forage poisoning but as hemlock poisoning, larkspur poisoning, etc.

The title given me for my paper was forage poisoning, but one paper could not begin to touch on this large field, so I will confine the remainder of the paper to botulism.

Botulism is a disease affecting all animals. Horses, mules and asses are more susceptible, with the dog slightly susceptible. The writer has seen two cases of botulism in dogs. Cattle, sheep, goats and swine seem to have about the same resistance. Pregnant animals are more susceptible than nonpregnant. Chickens are slightly susceptible. It seems that chickens and dogs receive the infection from maggots or decomposed animal matter, and this only in the hot months of summer, while nearly all botulism affecting other animals will be found during winter and spring. The winter and spring following a drought seem to increase the number of cases of forage poisoning, while we may find a sporadic outbreak at any time. We may also find only one animal out of a large herd or stable to be affected while on the same feed as the others and the others remaining healthy. This is accounted for by the peculiarities of *Bacillus botulinus*, inasmuch as it is an anaerobe. Should one small spot of a silo be contaminated and the air excluded from this particular spot, the toxins would be present in this one patch.

[1] Presented at the meeting of the Kentucky Veterinary Medical Association, February 7-8, 1922.

The animal receiving this one particular forkful would develop the disease and possibly die, while all others remained healthy.

ETIOLOGY AND BACTERIOLOGY

Botulism is due to a specific anaerobic organism known as *Bacillus botulinus* and described as being a large, straight rod with rounded ends, 0.8 to 1 micron wide and 2½ to 6 microns long, slightly motile. Spores form in alkaline glucose pork broth at room temperature. The spores are oval in shape, distending the wall of the organism, and situated near the end of the bacillus. The organism is Gram-positive and stains readily with the ordinary anilin dyes. The bacilli are single but may occur in short chains.

MODE OF INFECTION

As the term "forage poisoning" implies, the infection comes from contaminated feeds. The appearance of the feed seems to have very little to do with forming an opinion of just which feed contains the poison. It has been found that bright, wholesome-looking feed is just as apt to contain the poison as is moldly or damaged feed. When a ration of corn, hay and silage is fed and an outbreak occurs, it will be necessary to conduct a feeding test to ascertain just which feed to condemn.

MORBID ANATOMY

The morbid anatomy is variable, according to the severity of the attack, but may involve changes in the mucous and serous membranes, the meninges, lungs, heart and kidneys. In animals which die within a few hours after symptoms manifest themselves scarcely any changes are noticed. As a rule, however, the gross lesions noticeable will be: Meninges slightly injected; slight congestion of the lungs; hemorrhagic spots on the heart wall; local areas of ramification on the inner walls of large colon, with scattered punctate hemorrhages; liver engorged with blood; kidneys hyperdermic and capsule injected.

SYMPTOMS

The symptoms are loss of appetite, muscular tremors, salivation, nervous attitude, respiration accelerated, paralysis of the tongue and pharynx, slight watery discharge from nostrils,

awkward prehension of feed, yawning, chewing, obstinate constipation, incoordination, stupor and decumbency. The temperature is normal or slightly subnormal. The animal after becoming decumbent will work the legs as if running for a time and then lie quiet for a time, often cutting the legs. However, animals seem to notice things about them until the very last stages of the disease.

The period of incubation seems to be from one to ten days. Animals die in from twenty-hour hours to four or five days. Some even die without showing any noticeable symptoms. These cases, however, are rare, the most cases showing symptoms for twenty-hour hours to two or three days before death.

DIFFERENTIAL DIAGNOSIS

Botulism may be mistaken for an inflammation of the brain, but the temperature in the latter would tend to differentiate between the two diseases, together with the salivation and paralysis of the tongue and pharynx. Other forms of poisoning might be confused with botulism, but it is not at all difficult to make a diagnosis of botulism after the symptoms have been studied, together with the history, which generally puts one on the right track.

PROPHYLAXIS

The injection of 40 to 100 c.c. of polyvalent botulinus antitoxin intravenously for horses and mules will protect them for a short time, possibly ten to thirty days. However, if the injection is given and the animals kept on feed contaminated with *Bacillus botulinus* they build up a permanent immunity. This, however, can not be wholly depended upon, inasmuch as there is no known way of regulating or ascertaining the amount of the toxin given. By repeated injections of the antitoxin it is possible to feed out the remaining contents of a silo or loft with safety.

TREATMENT

The treatment consists of intravenous injections of 40 to 100 c.c. of polyvalent botulinus antitoxin. Large doses have been recommended, but our experience has taught us to prefer the smaller dose of 40 c.c. repeated at 12 to 24-hour intervals. Catheterize at each visit for injections. Potassium permanganate

in solution should be given if the patient can swallow and is not too nervous. Anything that irritates or annoys the patients only tends to shorten their stay here on earth, and one should bear this fact in mind just as much as when treating a case of tetanus.

Cases taken in time, before the pharynx becomes paralyzed, should be given a cathartic. The stomach tube comes in handy in animals which are not irritable, and large quantities of salts may be given.

No fixed line of medication can be followed, as one must treat the symptoms present and as they present themselves. Enemas should be used if possible. Hypodermic evacuants are not practicable, inasmuch as they increase the saliva, and the animal, not being able to swallow, will often drown in his own secretions.

The most satisfactory treatment in our hands have been, first, antitoxin in 40 c.c. doses, repeated in 12 to 24 hours; second, potassium permanganate, the old remedy before antitoxin was used. This along with a cathartic and enemas. With this treatment we feel, even though the animal dies, we have done all that was in our power.

MEXICAN QUAIL ARRIVE IN LARGE NUMBERS

Between January 28 and April 20, the closing date for the season of entry of Mexican quail, 37,953 quail were entered at the ports in Texas. This is the largest number since shipments began in 1910. Of these, 9,773 were entered at Brownsville; 15,408 at Laredo; and 12,772 at Eagle Pass. Most of these birds were shipped to Kentucky, Maryland, and Pennsylvania, and distributed through the game commissions for propagating purposes.

Quail disease appeared at Laredo about February 23, and 500 birds were placed in quarantine, but with this exception few losses occurred from the disease. On the whole, the season has been one of the most successful in recent years.

Among the officials of the newly created bureau, known as the Packers and Stockyards Administration of the U. S. Department of Agriculture are the following well-known veterinarians: O. E. Dyson, T. A. Geddes, S. O. Fladness, Frank W. Miller and M. Guillaume.

ANEMIA (CHLOROSIS) IN THE DOG

By OSCAR SCHRECK
New Haven, Connecticut

ANEMIA signifies poverty of the blood of the animal, characterized by a very marked relative reduction in the hemoglobin of the blood. This condition is met with at times in the small animals, as a consequence of great hemorrhages, insufficient nourishment, or any affection that prevents the nutriment intake from being properly absorbed or assimilated, thus impoverishing the blood by depriving it of its most needed constituents; also from profuse chronic discharges, which drain the blood of many of its important elements, and especially of its albumen. Besides these causes of anemia, we find it many times occasioned by poisons, as from distemper, or by retention of noxious ingredients in the blood; in fact, this is the most important form found in the small animals, there being a lack of the important constituents of the blood (red corpuscles), therefore the density of the blood is diminished.

In severe anemia and chlorosis (hydremia) the blood is watery; in marked leukemia it looks a peculiar whitish-red as if mixed with milk, or chocolate color. Upon coagulation it exhibits a great excess of serum; the clot being very small, of a light reddish or rosy tinge, instead of the deep redness of health, and floating in an abundance of nearly or quite colorless liquid. It is, however, usually rather firm, and not infrequently exhibits a buffy and cupped surface. The proportion of red corpuscles is obviously much diminished, and the same is probably the case, to a certain extent, with the fibrin. It must be admitted, however, that there is usually a great deficiency of red corpuscles, not only in relation to the watery portion of the blood, but also to its remaining solid constituents.

Even in the anemia from hemorrhage this relative deficiency is observable, for, though all the constituents are lost in the same proportion, yet the organs concerned in the production of blood find in the animal system much larger supplies of the albuminous and fibrinous principles than of those which constitute the red corpuscles, and, besides, as these probably are a higher result of vital organization, they must be the last to be

generated. The cause of the buffy coat of the clot in anemia is the relative excess of the fibrin over the red corpuscles. It is altogether independent of inflammation.

Puppies and kittens are often affected with this trouble, as the occurrence of the disease is seen frequently in the young, highly bred animals or those of fancy breeds.

ETIOLOGY

Many causes have been assigned for anemia. The tendency to it is influenced by age and peculiarities of the individual. Animals in the extremes of animal life—as puppyhood and the aged—are more liable to anemia than those in the period of maturity. In puppyhood the needs of the growing organism are such as to require the utmost amount of pabulum from the blood; the interchanges are more rapid, the consumption of material greater, and hence the more ready development of anemia, if other circumstances coincide.

In aged animals, on the other hand, the productivity of the animal is diminished, hence the waste may easily exceed the demand if there be any disturbance either in the preparation of materials for the blood or in the retrograde metamorphosis of the tissues.

There are also cases in which it is believed that there is a predisposition to this complaint, a peculiar type of animal construction (abnormally small heart). Such animals are in a condition the opposite of plethora, and are deficient in the amount and quality of blood.

A most powerful exciting cause is an insufficient supply of proper food for the animal, or the food may be otherwise unwholesome. Again, the food being abundant, anemia may be the result of poor digestion and faulty and imperfect assimilation. Also the absence of light, air and exercise. Such causes have been observed in kennels, where two or three animals were affected at the same time. The same may be said of exposure to cold and dampness in the smaller toy breeds and kittens. Prolonged overexertion and debilitating agencies in general impair the vital processes and induce anemia.

Frequent repetition of the sexual act will often be met with in breeding kennels, and also prolonged lactation. This explains, with other causes, the frequency of anemia in the bitch. Also hemorrhages are very powerful causes of the disease.

Anything that will decrease or interfere with the production of the red corpuscles, such as indigestion or imperfect nutrition, from whatever cause, such as derangements of the liver, kidneys, spleen, etc., will cause the disease. The excessive action of the heart, so common in anemia, may lead to derangement of the liver, and is quite common in the aged animal; also the feebleness of the parietes from defective nutrition may lead to anemia. Extensive discharges from wounds, persistent diarrhea, or the sequelæ of distemper, are all causes.

Under all these circumstances, we have to deal with a watery blood, deficient in red corpuscles; in other words, with an anemic condition. Two cases coming under my observation were due to the constitutional action of lead, such as lead and opium wash, used in the treatment of eczema.

SYMPTOMS

The onset in most cases is of an insidious nature, unless due to hemorrhage or exhausting diarrhea, etc. The main symptoms of this condition are an abnormal paleness of the skin (inner side of the thighs, testicles and abdomen) and a pale, bloodless condition of the visible mucuous surfaces, such as the gums, inner side of the lips, conjunctiva, etc. This paleness is undoubtedly present in the vast majority of cases, and still this can not be a criterion, for it sometimes happens that the skin and mucous membrane are anemic or pale, and yet no anemia is found when the blood is examined; then again the skin and visible mucous membranes have a normal color, and yet anemia may be actually present. The legs will be found cold, from faulty circulation, or blood poor in needed elements, and at times are swollen more or less; eyes sunken, with a glistening cast of the sclerotic.

The secretions are sometimes diminished, and associated with this condition are extraordinary dryness of the skin, brittleness of the toenails so that they break close to the flesh, and harshness of the hair, with intense thirst. The hair is often seen to desquamate in patches. Also in some cases there is a slate-colored appearance of the Schneiderian membrane. The bile is also frequently scanty, and there is costiveness, with unhealthy alvine evacuations.

The organs of special sense are peculiarly affected. Vomiting, great muscular debility, and not infrequently irregular muscular contraction, amounting even to convulsions; restlessness, jactation of the head, loss of appetite—still in some cases there will be a morbid, craving appetite—are among the occasional symptoms in acute anemia. In some cases there will be a slight rise in temperature, and we also find in some cases a subnormal temperature. The pulse is soft, compressible, jerky, and easily excited, and is always aggravated by either excitement or bodily exercise, with general lassitude and inability to take much exercise, showing a want of energy in the heart's impulse. Violent exertion often throws the heart into the most tumultuous action. The respiration, though quiet when the animal is at rest, becomes hurried and even painfully agitated under exertion, as in running, ascending stairs, etc.

The rapidity with which the heart's contractions succeed one another is sometimes extraordinary, and not infrequently their rhythm becomes markedly irregular. There is good reason to believe that hypertrophy and dilatation of the heart may be induced. Occasionally vomiting will be observed, with more or less irritability and excitability of the animal.

DIAGNOSIS

Acute anemia from either internal or external hemorrhage is not likely to be confounded with any other condition. The diagnosis of chronic anemia is readily made from the history and general appearance of the animal.

PROGNOSIS

The prognosis in anemia is determined by the conditions under which it occurs. The earlier its cause is discovered, and the more readily removed, the better the prognosis. Its duration varies; some animals are anemic during their entire lives. When it is associated with or dependent upon organic disease, the prognosis is unfavorable. Death in acute cases results from annulling the function of the medulla, or cardiac paralysis. In chronic cases inanition and exhaustion or some complication induce the fatal issue. Death may occur in syncope, convulsions and coma.

In its early stage the disease is usually very manageable, and

when there are no organic complications, and the animal can be withdrawn from the influence of the causes, it may in general be cured, or at least placed in a fair way of recovery, in a period of time varying from two to four weeks. Under opposite circumstances, and especially when improperly treated, the disease may terminate fatally.

TREATMENT

Before this condition can be properly treated it should be determined whether it is a so-called blood disease or a condition caused by a disease of some other part.

Before deciding that a simple anemia is primary, all secondary causes must be eliminated; but there can be a primary anemia that is mild in form, which, if the cause persists, will become a pernicious anemia with the typical blood picture of the disease. In other words, a simple anemia may be caused by a mild type of the condition that is the cause of pernicious anemia—*i. e.*, pernicious anemia may be mild in type, if one is allowed the paradox.

Therefore in the treatment of this disease it is of the utmost importance to remove the causes. While these continue to act, the use of remedies will be only of temporary benefit. Should the digestive system be in disorder, it must be corrected; constipation must be obviated; any hemorrhage or other drain which may exist must be arrested. Also obviate all possible sources of ill health, and the formation of more blood in the animal. As the conditions to be remedied consist in an impoverished state of the blood also, obviously treatment must therefore be directed to the organs concerned in the elaboration of blood; the organs of digestion, including the liver, and the organs for the production of the corpuscular elements—the spleen and the lymphatic system.

Proper limits of exercise and good air promote the metamorphosis of the tissue, and are therefore very serviceable in anemia; but carried to fatigue, waste is greater than repair.

The preventive treatment of anemia, when it depends upon exhausting discharges, prolonged lactation, and unhygienic conditions, is removal of its causes.

Perhaps the next important of all treatments of anemia is fresh air and sunlight, in the best possible hygienic surroundings. The next most important element in the blood improve-

ment is the diet, and a diet that contains sufficient meat, combined with such vegetable foods as contain iron, and arranged so as to be most easily digested and assimilated by the individual animal. In other words, the diet in many cases must be individualized, embracing a large proportion of nitrogenous elements: fresh animal food (raw meat), eggs, milk, etc., and raw meat and fish for the cat. If solid food can not be managed by the stomach, beef tea, or juice, and milk can be given instead. The forcing of food in the small animals is by me condemned, for my experience is that what the dog does not eat spontaneously is not digested, and thereby causes digestive disorders and destroys any little appetite the animal may have.

The next consideration in the treatment of secondary anemia is that of drugs, and whether or not drugs can stimulate the organs concerned in the production of healthy blood corpuscles. The principal origin of the red blood corpuscles in the matured animal is the red marrow. Sometimes most successful stimulation of the red blood-forming organs is caused by the administration of preparation of red bone marrow (see below). It is of frequent occurrence in any kind of anemia to find the red blood corpuscles increased in number under the administration of red bone marrow. Also medicinally, the administration of iron in some of its forms is highly recommended. This metal, indeed, appears to be almost a specific remedy in this disease. Different writers recommend different preparations, but they are probably all (if given in equivalent doses) equally efficacious. They are best administered in combination with some vegetable bitter or stomachic, such as quinine, cinchona, etc., and in association with occasional mild purgatives, such as mild doses of aloes and myrrh pills, to obviate the obstinate constipation which is so often present, due to a want of tone in the mucular coat.

Syrupi ferri iodidi	dr. ii	4.00
Olei morrhua	oz. viii	2.40
Acaciæ	oz. ii	62.00
Syrupi	oz. i-ss	50.00
Methylis salicylatis	dr. ss	2.00
Aqua distillatæ q. s.	oz. xvi	500.00

Misce et fiat amulsum.

Sig.: Two to three teaspoonfuls after feeding T. I. D.

Indications: Anemia, after hemorrhage. Eggs, milk, and hygienic measures.

I have found malt extracts combined with iron and pepsin

efficacious in the treatment of this affection; also Blaud's pills, 3 to 5 grain doses two or three times a day. (These pills should be made fresh as needed.) Also iron and quinine citrate, 3 to 5 grain doses. I know of no more suitable and easy method for the administration of iron preparations to the small animals than Blaud's pills.

As a general tonic, iron may be ranked as perhaps the first on the list. In action on the animal system it produces all the effects that are characteristic of tonics; it improves the condition of the digestive organs (except in an occasional case), imparts tone to the muscular fiber, increases the action of the heart and blood vessels, and quickens the various secretions. Iron acts also directly on the composition of the vital fluid itself. This can be proven by analysis of the blood before and after the administration of iron. Disorders of digestion so common in this disease usually yield to bismuth and aromatic powders. Still whatever preparations are used should be altered or changed for another after a week or ten days' treatment, and returned to again if needed.

A number of incidental effects may be produced by the long-continued use of iron, principally upon the digestive tract of the animal. One observes in some cases in the small animals with normal digestive powers, after the administration of iron or its preparations, a disturbance of digestion and vomiting, especially when given on an empty stomach.

In anemia of lactation there is a very marked deficiency in the quantity of phosphate of lime, and in all forms more or less reduction of the proper amount of this substance. Therefore the syrup of lacto-phosphate is the best form for the administration of this agent for the above, if well and genuinely prepared. Also emulsions of cod-liver oil are valuable adjuvants when they agree with the stomach of the animal. Also very useful for promoting the nutrition of the animal body, cod-liver oil takes first place. The rapidity of the cure in some cases with this oil is very surprising.

Syrupi ferri iodidi	**f. dr. ii**	**8.00**
Emulsi olei morrhuæ	**f. oz. viii**	**240.00**

Misce.

Sig.: Tablespoonful two hours after feeding.

Indications: Used in anemia and debility following severe illness.

Pilulas sodii cacodylatis	aa gr. ss	0.03

Sig.: One pill after feeding.
Indications: In anemia of the pernicious type.

Castorei	gr. xxiv	1.60
Ferri valeratis	gr. xxiv	1.60
Quinine valeratis	gr. xxiv	1.60
Zinci valeratis	gr. xxiv	1.60
Extracti cascaræ sagradæ	gr. xxiv	1.60

Misce et fiat pilulæ No. xlviii.
Sig.: Two to three pills T. I. D. after feeding.
Indications: Used in anemia after distemper, with nervous symptoms.

COUNTY TESTS ALL CATTLE IN A WEEK AND A DAY

The plan for the complete eradication of tuberculosis in the cattle herds of the country does not seem beyond the bounds of possibility when it is demonstrated that an entire county may be cleared of all its reactors in a week and a day. Such a demonstration was recently completed in Essex County, New York, where local authorities, assisted by the State and the United States Department of Agriculture, began the testing of the herds on Friday, May 12, and finished the work on Saturday, May 20.

The county was divided into convenient districts, and 25 veterinarians were taken from farm to farm in automobiles by 25 leading farmers who volunteered their services. By this use of rapid transportation and by careful planning of routes it was possible in two days to test 920 herds containing 5,274 cattle. This was an average of more than 18 herds a day for each veterinarian. Because the loss of time was cut to a minimum and supplies were bought in quantity, the work was done for less than half the usual cost when herds are tested individually.

The most remarkable fact about this campaign is that 100 per cent of the farmers in the county were ready and willing to have their cattle tested. The explanation is to be found in the cooperation of the Board of Supervisors and the Farm Bureau of the county and in previous demonstrations, which had shown the good results of cleaning out the disease. The members of the Board of Supervisors were convinced that a complete cleanup would be a benefit to every farmer and to the county as a whole.

The advertising value of a tuberculosis-free county is the principal factor in making such work popular.

THE RELATION OF PUREBRED SIRES TO THE LIVESTOCK INDUSTRY [1]

By THOMAS M. OLSON
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THE SUBJECT of this paper has been chosen largely for two reasons: First, because the relation of the work of the veterinarian is more closely allied to the breeding of livestock than to any other phase of the livestock industry. Secondly, because the purebred sire is one of the greatest factors in the success or failure of livestock raising.

Unfortunately very little definite information can be given regarding the science of breeding. It is only within comparatively recent times that the scientifically trained minds have grappled with the question with a view of bringing to light some practical application of the principles involved.

Perhaps we are overzealous in expecting more exact information regarding this mysterious process in the formation of new life. This is particularly cogent when we are reminded that it is only about a century and a half ago that Robert Blakewell put into practice for the first time some of the principles which we now know to be conducive to livestock improvement. He made a conscious effort to select only the most desirable animals, or such animals as conformed to his ideal, for his breeding stock. He went one step farther when he sought to fix the desirable characteristics by mating animals possessing such characteristics. This practice intensified and added prepotency to the common character.

We must not forget that our early shepherds as far back as thirty centuries ago followed the practice of selecting what to them were their best individuals for their breeding pens. This commendable practice, we must admit regretfully, is not followed by a number of our smaller breeders and many farmers of this age.

Primitive as these practices may seem, they harbor the nucleus of what our foremost breeders and scientific workers along breeding lines today regard as essentials in the progress of livestock breeding.

[1] Presented at the meeting of the South Dakota Veterinary Medical Association January, 1922.

Our research institutions have perhaps emphasized the nutrition end of the livestock industry more than the breeding. No doubt there are many reasons for this, but not the least important is the fact that it is absolutely essential that feeding be understood if success is to follow. I will digress from my subject long enough to say that even the best bred animals can not do justice to themselves or their progeny unless properly fed and managed. It is unfortunate that even in this advanced age too many farmers and breeders seem to be laboring under the impression that when a long price is paid for an animal of good breeding with an enviable reputation, highly deserved, the owner has done his share, and now it is up to the animal in question to sustain this reputation and demonstrate his breeding qualities. To the experienced breeder this course of procedure is fallacious, and frequently fatal to the one who attempts it, as well as to the reputation of the animal in question. Proper feeding and management can not be neglected if even mediocre results are to be obtained. The lack of proper feeds fed in sufficient amounts is the mill-stone on the livestock industry, particularly dairying.

Second only to feeding is the question of breeding. We have heard so many times the trite expression that "the sire is one-half of the herd." If the history of our progress in breeding is to be the criterion, we must concede the truth of the expression with an added qualification that he is "frequently more."

As we scan the pages of breed history we are impressed with the number of sires which have stamped their individuality so indelibly on their progeny that they have been designated fountain-heads of breed families, or even new breeds. The prepotency of the sire in fixing and transmitting desirable characteristics is verified in innumerable instances with all classes of livestock.

In dairy breeds we have such noted sires as Sophie Tormentor, the fountain-head of a family of Jerseys which have proven their merits in their ability to produce and reproduce with a consistency and persistency that could only be the result of good breeding. Golden Glow's Chief was the sire of Vive la France, conceded by all to be the wonder cow of all breeds, and Silken Lady Glow, two cows which have produced remarkable records and come dangerously near breaking the records for

their breed. These are only two sires of the Jersey breed. Many others equally prepotent might be given.

Hengerveld DeKol, the bull which put Pontiac, Michigan, on the map, so far as livestock breeders are concerned, is just one instance of hundreds of Holstein bulls which have manifested such prepotency in siring high producers that they were outstanding sires. Anxiety 4th in the Hereford breed is another instance of many in that particular breed.

Among our great horses we have such an outstanding sire as Peter the Great. During the season of 1920 there were 21 three-year-olds that made records of 2:10 or better. Eleven of these were sired by Peter the Great. He has sired 59 animals which have records from 2:10 down to 2:01¾. One of his daughters holds the world pacing record, 1:58¼ for the fastest pacing mare. Hambletonian 10 is another outstanding sire, which further substantiates the prepotency of the sire over the dam.

It is interesting, if not significant, to reflect on the result of mating a jack with a mare. The offspring is called a mule, which possesses the characteristics of its sire and not its dam. Its ears, tail and hoofs, as well as its general body conformation, are those of the sire. On the contrary, when the stallion is mated with the female ass or jenny, the offspring or hinny possesses the characteristics not of the jenny but of the male, the stallion. Its hoofs, tail and ears are like those of the sire.

The foregoing are only a few of the many cases which might be given to show the prepotency of sires, but my purpose is to call attention only to the important role the sire plays in our livestock industry. In view of the importance of sires, it would seem from a purely business standpoint that greater care should be exercised in their selection. When a good one is found his services should be utilized to full capacity and the progeny given every opportunity to prove their merits.

The data to which I shall call attention later are taken from work on dairy animals; however, the underlying principles involved are equally applicable to other classes of livestock. In ascertaining the value of a dairy sire we have a very accurate and complete unit of measurement, namely, the milk scales and the Babcock test. When other conditions are comparable it is possible to gage in a most accurate manner the prepotency of a

sire to increase the milk and fat production in his progeny. A second reason for calling attention to these data is that the dairy industry seems to have relatively fewer purebred sires than other classes of livestock.

The 1920 census shows that we have in the United States 752,371 males, of which 187,299 are purebred; thus about 25 per cent of the sires used in mating on dairy cattle are purebred. That must necessarily mean that a large number of scrub or grade bulls are used in the United States. In South Dakota the 1920 census reports 13,515 males, of which 1,353 are purebred, or about 10 per cent. The same census reports 406,075 dairy cows, including heifers one year old or over. That would indicate that in South Dakota we have only one purebred sire to every 300 dairy cows. Is it fair to assume that a large number of the 406,000 dairy cows are being served by scrub or grade bulls?

It seems well-nigh unbelievable that stock raisers should continue using scrub, grade or even "scrub purebred" sires, in view of the convincing and conclusive data which are available to show the merits of good purebred sires when mated with scrub or grade cows. Authorities are agreed that a good purebred sire is the surest, quickest and cheapest method of increasing the production of a dairy herd.

In 1907 the dairy department of the Iowa Experiment Station procured from Arkansas eight animals—seven cows and one bull. These animals were undersized and inferior in every way when judged from the standpoint of dairy cows. They were just plain scrubs. These cows were placed in the college herd and fed a balanced ration and later bred to purebred bulls of the Holstein, Guernsey and Jersey breeds. Such records were kept as were necessary to a comparison of the production of the daughters and their respective dams. A summary of this work is given in Table 1.

An analysis of this table emphasizes the important role which a sire plays in increasing the production in the progeny. It is also of considerable interest to note the high average production of the scrub dams under favorable feeding conditions. When we bear in mind that the average production for all cows in the United States is 3,412 pounds of milk, we are somewhat amazed to learn that these scrub cows, with no particular merit

as dairy cows, should average 3,847 pounds of milk, thus exceeding the average for all cows in the United States. This remarkable showing can only be credited to the feed and management which the cows received after being placed in the college herd.

TABLE 1.—AVERAGE OF TWO GENERATIONS OF GRADE COWS AND THEIR SCRUB ANCESTORS, IN EXPERIMENT AT IOWA EXPERIMENT STATION.

	Scrub dams				Daughters				Grand-daughters				Increase in production			
													First generation		Second generation	
Group	Number of cows	Number of lactations	Milk	Fat	Number of cows	Number of lactations	Milk	Fat	Number of cows	Number of lactations	Milk	Fat	Milk (per cent)	Fat (per cent)	Milk (per cent)	Fat (per cent)
Holstein...	3	16	3,673.8	167.36	3	15	6,757.5	275.66	5	9	10,063.2	385.46	84	65	174	130
Guernsey..	3	13	4,496.6	199.62	3	10	4,843.8	229.74	5	8	7,744.9	388.23	8	15	72	94
Jersey.....	2	13	3,394.0	172.52	2	5	5,460.5	298.00	2	2	5,389.2	282.92	61	73	59	64
Average ..	17	36	3,847.0	182.40	8	30	5,944.7	261.93	12	19	8,311.4	375.81	55	44	116	106

[1] One scrub cow which was mated with a pure bred Holstein bull was later mated to a pure bred Jersey bull.

The data also indicate that there is a vast difference in purebred bulls. Attention is directed to the result obtained by mating the purebred Guernsey bull with scrub cow No. 33, producing cow No. 87. Her average for four lactation periods was 3 per cent less milk and 2 per cent less butterfat than her scrub dam. Again, when cow No. 58 was mated with another purebred Guernsey bull the progeny, heifer No. 175, for three lactation periods produced an average of 107 per cent more milk and 112 per cent more butterfat than her scrub dam.

It is significant to note the average of the 7 scrub dams for 36 lactation periods, as compared with 8 daughters for 30 lactation periods in the first generation, and 12 granddaughters for 19 lactation periods in the second generation. This phenomenal increase in both milk and fat can only be attributed to the prepotency of the bulls used in siring high-producing daughters. All conditions outside of the breeding were identical, hence the one factor—namely, the sire—comes in for full credit for this increase.

Considerable data from different experiment stations might be given to prove further the important role of purebred sires, but because of lack of space they will be omitted. The mere

fact that a sire is purebred is not an absolute guaranty that the offspring will be an improvement over the dam. If that were so, the road to success in livestock breeding would be comparatively simple and easy of attainment. However, we find that purebred sires sometimes have a detrimental effect, rather than a favorable one, in improving the offspring.

Perhaps no available data which are authentic better set forth this fact than the data in Table 2, compiled by Eckles of the Missouri Experiment Station.

TABLE 2.—COMPARISON OF PUREBRED JERSEY SIRES USED IN THE UNIVERSITY OF MISSOURI HERD.

Sires	Dams				Daughters				Increase in production	
	Number of cows	Number of lactations	Average production		Number of cows	Number of lactations	Average production		Milk (per cent)	Fat (per cent)
			Milk	Fat			Milk	Fat		
Missouri Rioter	4	23	5380	234	4	26	4381	216	—19	—8
Hugorotus	11	62	4969	231	11	50	4576	245	— 8	6
Lorne of Meridale	12	66	4559	231	12	67	5969	287	31	30
Missouri Rioter 3d	3	14	4775	238	3	15	8005	384	38	61
Minettis Pedro	20	66	5321	268	20	66	5376	271	1	1
rown Bessie's Registrar	5	8	6029	293	5	8	4295	217	—29	—26

In 1884 the Missouri station procured 4 Jersey cows and a bull, Missouri Rioter. The average production of the four original cows should be compared with the production of their daughters sired by Missouri Rioter. The daughters of Missouri Rioter were mated to the second herd sire, Hugorotus, and so on. The table represents a period of 26 years, in which time purebred sires were used and mated with purebred cows, yet the daughters of the final mating showed a lower average production than the original four cows purchased 26 years previously. Twenty-six years of breeding, and then learn that one has poorer producers than the cows with which one started the herd is certainly discouraging experience, to say the least. Yet it is a safe conjecture that such is the experience of a large number of our farmers and smaller breeders. If careful production records had not been kept on these animals, the merits of the various bulls would not have been known, neither would the demerits of the various daughters as compared with their dams have been ascertained.

These data certainly impress one with the importance of selecting a sire in which the prepotency for transmitting milk production is well fixed. They also put in the foreground the

need of a practice which is too often neglected, and that is the keeping of "production records." One safeguard, which will at least reduce the chance of a bull siring poor producers, is to buy bulls from dams and sires with production records back of them. It is true that one would have to pay more for such animals, but when one views the results of 26 years of futile breeding, as shown in Table 2, the initial price would be secondary, rather than the primary consideration.

The safest practice to follow is to buy bulls which have been tried and proved prepotent. The only serious obstacle to this course of procedure is that such bulls can not, as a rule, be bought. The breeders who know they have such animals in their herds usually can use them during their entire period of service. However, it is a well-known fact that many good-producing sires have been and are being sold for meat, and their prepotency never known or determined until too late. The moral is that farmers and breeders should keep production records on the daughters of a bull, and ascertain before he is slaughtered whether he is a counterfeit or a real producer of high-producing daughters.

Perhaps when our breeding practices have progressed to the stage where characters become so fixed that they are transmitted to their offspring in each case we need not practice such careful culling. When the character of heavy milk production has become as dominant as the white face in the Hereford we can be reasonably sure when we mate two animals of high milk-producing tendencies the offspring will be a high producer. We would be very much chagrined should we mate a purebred Hereford cow with a purebred Hereford bull and get a black-faced calf. It seems only reasonable that other characters could be fixed so that they will be transmitted with equal accuracy.

This goal in livestock breeding can not be reached by the practice which is followed by so many of our breeders at the present time. Some system of breeding which will accomplish the results sought must be inaugurated and be followed until the desirable characters have become fixed to such a degree that they will be transmitted in nearly all cases. The failure to do so should be the exception rather than the rule. We are cognizant of such persistency in transmission of characters in the case of mating polled animals with animals which naturally

have horns. Many other instances could be given to indicate that it is possible to fix characters to such a degree that their failure to breed true would be rare indeed.

Inasmuch as we wish to intensify the characters, it would seem that any system of breeding which would accomplish this end should be used. Authorities on breeding are agreed that line breeding and inbreeding do intensify characters, good as well as bad. It would seem, therefore, that a judicious system of line breeding or inbreeding would accomplish the end sought. It is apparent that good judgment must be exercised in the selection of the animals which are to be mated, otherwise there is serious danger of producing animals of undesirable characters which are highly prepotent in transmitting these characters.

Some of the evils resulting from inbreeding are decrease in vitality or constitutional vigor and lack of fertility. The effect which close breeding seems to have on these characters can perhaps be explained on the basis that this represents a common weakness of domesticated animals. Inbreeding is not wrong per se; it is only when animals of a common defect are mated, and this defect is intensified, that we are made conscious of the defect. After all, that is perhaps the surest and quickest way to detect this defect and eliminate such animals from the herd.

EXTENSIVE DRIVES AGAINST JACK RABBITS

A total of 683,800 jack rabbits have been killed as a result of jack-rabbit campaigns this spring in Utah, Oregon, and Washington. The figures are based on very close counts by farmers and other interested persons and are considered conservative. In the Goose Lake Valley, Oreg., while the actual kills of rabbits were not large, the saving of future crops was very important. This is an irrigated district that is coming into heavy production, and the rabbits do a great deal of damage, consuming feed that would otherwise be available for livestock.

In Boxelder County, Utah, extensive operations were carried on in five communities, and practically every community that undertook the work in a systematic way obtained very satisfactory results. More than 250,000 rabbits were killed in this county alone. In checking up the central Washington district a total of 155,500 rabbits were reported in six counties as having been killed between November and February. This is the most successful campaign ever conducted in the State.

FARM SANITATION[1]

By GEORGE W. STILES, JR.

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THE QUESTION of farm sanitation as influencing the welfare and happiness of mankind, particularly the rural population, is, in my opinion, one of the live issues of the present generation. Vital statistics and health surveys indicate the imperative need of improved sanitation on the average American farm. This is especially true with reference to the human element; however, the same general insanitary conditions constitute a factor worthy of more serious consideration than is usually given them as regards the well-being of our domestic animals.

Paramount among the factors to be considered on the average farm is the question of an adequate, pure water supply. Many devices are used to provide the farm house and livestock with sufficient water for their demands. These types may be considered under various headings, as follows:

WATER SUPPLY

Wells vary in depth from a few feet to several hundred feet, according to the location and thickness of the water-bearing strata encountered.

Wells of the shallow type range from 10 to 50 feet in depth, and are often dug near some stream of water, in marshy places, or in low-lying valleys. Because of the shallow source of the supply, water from such places is usually polluted from surface drainage.

Wells from 50 to 500 feet or deeper are conveniently classified as deep wells, some of which may be artesian or flowing. Water from such depths is generally less exposed to surface contamination than that from the more shallow type of wells. The depth of wells alone, however, does not always insure purity of the product, as much depends upon the topography of the country, surface protection, and the geological formation encountered during the process of drilling. Deep wells

[1] Presented before the Colorado Veterinary Medical Association, Denver, Colo., January, 1922.

are usually drilled or bored, while the shallow ones are more often dug or driven.

Wells may be further classified with reference to the manner of their creation. Some are open, walled with stone, brick, tile, or cement, and the water is removed by bucket or endless pump. Others are of this general type, but the surface is carefully protected by cement or other suitable coverings and the water is obtained by pump. Sand points are often used for shallow driven wells in loose, sandy soil, and may be satisfactory from a sanitary viewpoint, provided surface contamination is excluded.

The purity of a well-water supply depends largely upon the depth, surface protection, character of the soil and remoteness from sources of pollution. In locating a farm well the proximity to privy vaults, hog pens, barnyards and other avenues of contamination should be considered. The surface level or drainage is not always a safe criterion for locating a well. Faults, ledges of rock, crevices, dips and impervious strata may be factors diverting surface drainage into a well, thus destroying its value from a sanitary point of view. If possible a careful sanitary survey should be made by an experienced individual before locating a well for the farm water supply.

Other sources of water for use on farms are springs, cisterns, ponds, irrigation ditches, creeks and rivers.

Springs protected from surface contamination are desirable sources of water supply. When covered, and the water piped to the farm, such springs are valuable.

Cistern water is more often used for the family than for the livestock; however, proper precautions should be observed to protect the supply from pollution.

In this western country many farmers depend upon the use of impounded water, or ponds, for their stock. Very often this is the only available supply. Such places should be fenced in such a manner as to prevent animals from wading into the reservoir and rendering it dangerous from deposition of excreta and urine.

In the course of our field investigations attention has been called to the gross, filthy conditions observed on some farms. Stagnant pools, green with scum, harboring dead animals and other decaying organic matter offer a retreat for many bacterial and parasitic diseases. It may be only a coincidence, but many of the serious losses among cattle, horses, swine and sheep which have come to our attention have been on farms

where such animals were allowed to drink water from ponds as above described.

Irrigation ditches in this arid region, while necessary to agriculture, often become potent sources of disease-bearing water, through sewage contamination, from cities, abattoirs and stockyards. Bacterial pollution from anthrax, typhoid and kindred diseases may be water-borne for long distances, thus transmitting a specific disease from one farm to another.

Creeks and rivers, while valuable sources of water supply, are more or less polluted and perhaps are factors of disease transmission.

The ideal farm water supply is the deep well, properly located and amply protected from surface pollution. However, we have observed water drawn from deep, nonpolluted wells so carelessly handled afterwards that it became unfit for use.

A single instance is now recalled where an endemic disease was prevalent in a herd of fine horses and mules. The sick animals were not segregated but allowed to drink from the same common watering trough with the unaffected horses. Masses of slimy, purulent nasal discharges were noted issuing from the affected animals into the trough during the act of drinking, to be later swallowed by healthy animals, thus constituting a direct channel of infection from sick animals to well ones.

Calves infested with coccidiosis have been noted drinking from stagnant pools of water, which issued from a clear spring a short distance away, when by a little effort the spring could have been utilized to advantage.

Cholera in hogs has been noted breaking out on the bank of a small stream where the animals had free access to the water, and a few days later hogs below these pens on other premises became infected.

The following analyses illustrate the condition of some farm waters in this locality:

Waters examined in the Denver Bacteriological Laboratory

Well water, polluted	18
Watering places, tanks and troughs, polluted	6
Ponds and other surface waters, polluted	5
Well water, not polluted	3
Small streams, polluted	3
Irrigation ditches, polluted	2
Polluted wells treated with hypochlorite	2
Mine water supply for donkeys, polluted	1
Spring, not polluted	1
Total	41

Conclusions can not safely be drawn from so few samples examined; however, the results above outlined, and the experiences of other workers along these lines, give some idea of the frequency of polluted waters being encountered on the average farm in this section of the country.

So much for the water supply of domestic animals. Such creatures should have sufficient, pure water at all times.

FLIES

Persons whose daily tasks have brought them into intimate contact with life on the farm during the summer time well remember their experience with the pestilential fly. This dangerous pest, born and bred in filth, living and thriving on dead, decaying organic matter during the interim between meals, comes face to face with us during the dinner hour, and full opportunity is given to consider his ways.

Aside from being a direct and positive factor in human sanitation, the common varieties of flies about the farm, particularly in Southern States, may be factors of disease transmission. Anthrax has been transmitted by the bite of certain species of flies from one animal to another, and experimentally hog-cholera virus is said to have been carried by means of flies. Other animal diseases outside the tropics doubtless will be proved in the future to be fly-borne.

Ox-warble infestation, bots in horses, screw-worm infestation and other economic problems are associated with the general fly nuisance. Removal or proper protection of manure piles will largely govern the propagation of the common house and stable flies. Stable manure should be utilized for its fertilizer value, and not allowed to accumulate and become a menace to mankind. Through the avenue of accumulated manure doubtless many disease-producing organisms are harbored, remaining protected from natural agencies of destruction, until entrance is gained into susceptible animals, there to develop disease.

Perhaps many of our domestic animals are carriers of disease, either bacterial or parasitic, and through the natural channels of elimination these germs may be carried and reach the digestive tract of other animals through the avenue of contaminated feed and water.

FEED

It has long been considered necessary to feed horses and other farm animals good, pure, wholesome feed, whether grain,

grain products, hay or other roughness. Moldy corn for horses is ordinarily considered unfit for feeding. Musty hay and fodder are often viewed with suspicion, and oats contaminated with chicken excreta may result in botulinus infection. The idea that swine can eat anything doubtless is an erroneous attitude toward these useful animals. Rotten, decaying potatoes may induce a form of toxemia, and the feeding of dead animal carcasses to hogs is a dangerous practice. Our records indicate an outbreak of anthrax in swine where 17 of 25 head died from eating a portion of a cow dead from this disease.

Garbage feeding is sometimes a source of disease transmission through ingestion of tuberculosis material, and cholera in swine has been communicated by the use of uncooked garbage. Spoiled meat and canned goods when fed unheated to poultry occasionally produce fatal illness with "limberneck" or botulinus infection.

Domestic animals should not only have free access to a pure water supply, but they should likewise be fed with clean, wholesome feed, for by so doing many losses may be prevented.

GENERAL SANITATION

It is a delight to see well-kept, properly located farm buildings, preserved with paint, fences in good repair, weeds reduced to the minimum, farm wagons and machinery housed and protected from the weather; green lawns and fields, shade trees, flowers, gardens, orchards; and lastly, a contented family with a good start of horses, cows, pigs and chickens. Nothing has been said regarding the conveniences and sanitary arrangements of the home, too frequently sadly neglected, the overworked mother left to get along as best she can, while the year's profits are wasting through rusty machinery, wire cuts in horses, chickens eaten by swine, due to the lack of proper fencing, and numerous other incidents too numerous to mention.

When farmers and their families realize that more intensive training and education are necessary, such as is furnished by a four-year course in our State agricultural colleges, to fit them better for their life's work, then they will be brought to a greater realization of the value of sanitation on the farm; and modern toilet facilities will be provided in the home, removing the dangerous privy vault, greater care will be exercised in the location of the farm well, the general insanitary conditions prevailing about the ordinary farm will be overcome, and their attending dangers removed or reduced to a minimum.

CLINICAL AND CASE REPORTS

(Practitioners and others are invited to contribute to this department reports of unusual and interesting cases which may be helpful to others in the profession.)

RHABDOMYOMA OF THE LUNGS OF A SHEEP[1]

By L. ENOS DAY

Branch Pathological Laboratory, United States Bureau of Animal Industry, Chicago, Illinois

TUMORS which are composed principally of striated muscle fibers are of rare occurrence, and especially so in organs other than those of the genito-urinary system.

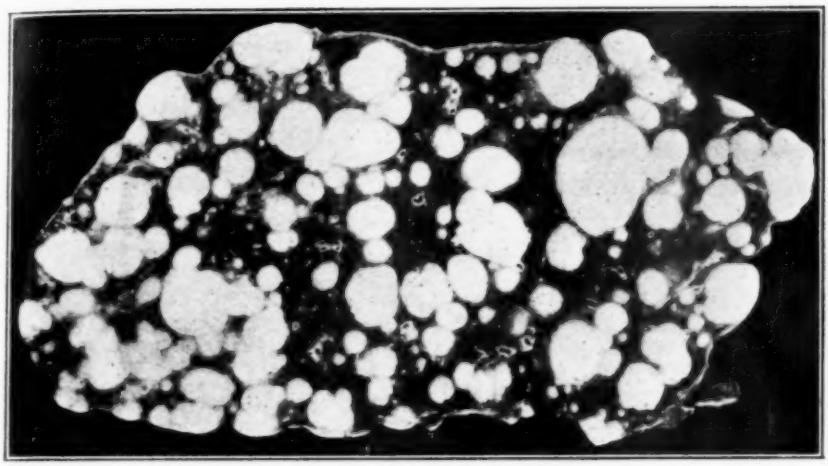
With reference to form, Ewing states that they may appear as single or multiple, nodular or voluminous, flat or rounded, circumscribed or diffuse, and even polypoid growths. This statement is supported by most of the writers. The growths are usually soft and of a gray color on section, mottled with tiny bands of a slightly darker color, which lie in an abundant connective tissue stroma, although cystic forms have been reported.

Rhabdomyomas usually occur in early life, and most of them are probably congenital, yet there have been exceptions. Fujinami observed one in a patient 50 years of age and Wolf in a patient 75 years of age.

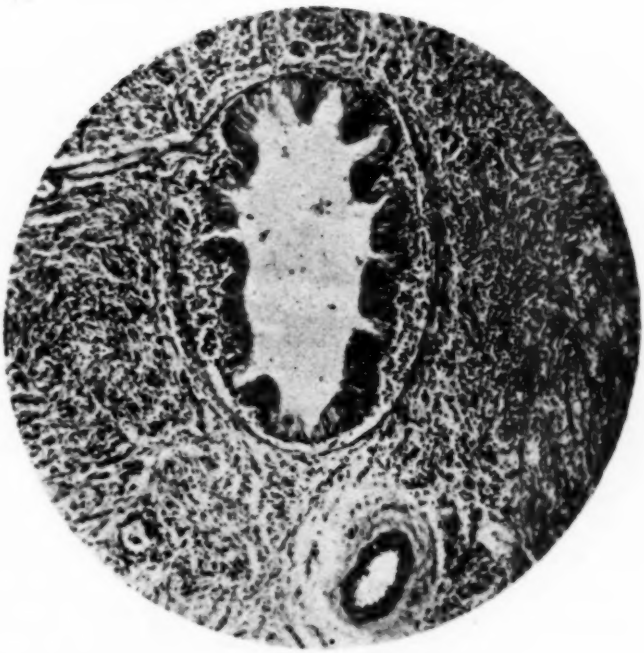
These neoplasms are generally considered as nonmalignant, yet there have been instances in which metastases were observed. Malignancy in these growths appears to depend wholly on the presence of rapidly growing muscle cells.

The subject of this report, a lamb four or five months old, was slaughtered at one of the large packing establishments in Chicago, Ill., some time ago. The sex and breed were not recorded at the time of slaughter. Upon evisceration both of the lungs were found to contain perhaps a thousand or more spherical nodules, which ranged in size from 1 mm. to 2 cm. in diameter. A cut surface through the greatest diameter of the caudal lobe of the right lung exposed 185 of these growths, which were quite evenly distributed through both lungs. Some of the larger growths were situated just beneath the pleura, but did not appear to involve this membrane. Generally speak-

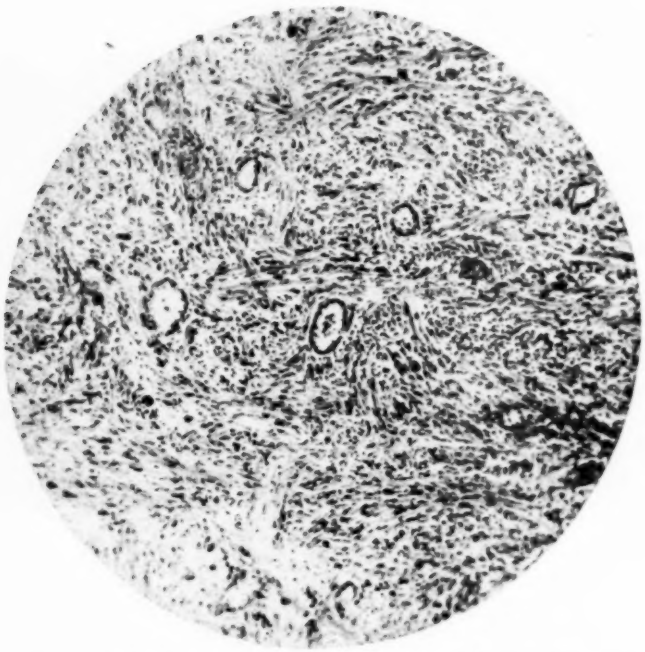
[1] Presented at the Fifty-seventh Annual Meeting of the American Veterinary Medical Association, Columbus, Ohio, August, 1920.



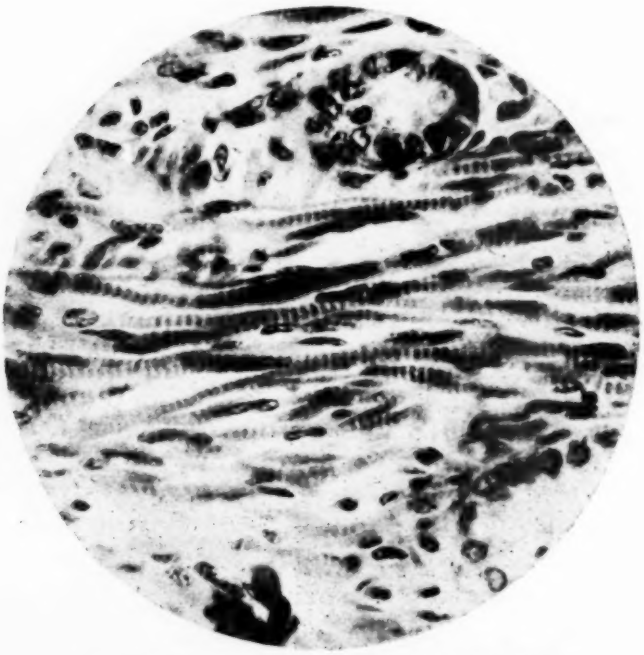
Cut section through caudal lobe of lung



Bronchial tubule. (X 95)



Interlacing of muscle fiber; also circular opening lined with epithelial cells. (X 95)



Striation of young muscle fibers. (X 550)

ing, the peripheries of the neoplasms were comparatively smooth, yet some of the larger ones showed a few bosselations on their surfaces, which appeared to be an outgrowth of tumor substance. In a few places there was a coalescence of two or more tumors. On incising they were fairly firm, but not firm enough to suggest a preponderance of fibrous tissue. The cut surface was pinkish gray, slightly mottled with short bands of a slightly deeper pink.

The lungs appeared normal in size, and the lung tissue which was not involved in the new growths seemed normal in color and texture. All other organs were reported normal by the inspector who conducted the autopsy.

Specimens for microscopical examination were taken from some of the larger as well as some of the smaller growths, as it was desired to secure sections which would be representative of all. The specimens were fixed in Zehner's fixing fluid and later embedded in paraffin. Sections were cut about 5 microns in thickness, stained with Harris's hematoxylin and eosin. A few sections were stained with phosphotungstic acid hematoxylin with very good results.

In viewing the sections under low magnification a large number of long cells, grouped in bundles, extended in all directions. In places the bundles were of even thickness throughout and were woven together in basket fashion. In other places the bundles were fan shaped and were lodged in what appeared to be a stroma of small, round and more or less irregular cells, which constituted not more than 25 per cent of the field. Scattered through each field were from six to eight circular openings lined with large cuboidal cells. At first these were thought to be atrophic bronchioles. In sections from some of the larger growths bronchioles were encountered. In these instances the bronchiole appeared normal, with the exception of a collection of small cells between the epithelial and muscular coat and an edema of the wall and around the periphery of the bronchiole.

When higher magnification was used (about 350 diameters) the long fusiform cells which made up the bundles were found to be young, undeveloped, striated muscle cells, which were arranged in a very orderly manner. Some of the muscle fibers were not striated. In others only a part was striated; that is, one end of the fiber was striated, while the other end was

smooth. Others showed pale striations in the middle and the ends were smooth, and still others had pale striations along one side of their axis and the other side smooth. In many places there were both long and short fibers in the same field, also narrow and broad. The longest measured about 320 microns. The striations were about 2 microns apart. The broadest fiber encountered was 8 microns, while the narrowest was 2 microns. No definitely branched fibers were encountered. Some pear-shaped as well as spherical cells were seen. All of the muscle cells were devoid of sarcolemma. The nuclei were located in or near the center of the cell and never on the surface as in the adult striated muscle fibers. The cell protoplasm was homogenous. No glycogen droplets were seen as mentioned in cases of rhabdomyoma reported by Wolfensberger, Broch and Hibbert. These authors report observing glycogen droplets around the nuclei.

The muscle fibers seemed to be quite evenly distributed throughout the growths. There were very few cells other than mucle cells and cells lining tubules, which will be referred to later, encountered in the sections. Owing to the large number of small round cells present in rhabdomyomas in other locations of the body, some writers have suggested the term rhabdomyoma sarcomatoides. Since only a very few such cells were present in these growths, one could not look upon them as belonging to this class of new growths, but as a rhabdomyoma in the strictest sense of the word. Scattered through the growth were a large number of gland tubules, the lumen of which was from 10 to 180 microns. These tubules were lined with a single row of cells which appear to be epithelial in character and resembled somewhat those lining the tubules of the kidneys, only not quite so well differentiated.

The epithelium of the bronchi and bronchioles was well differentiated. There is an increase of lymphocytes between the mucous membrane and the nonstriated muscle. The muscular coat of the epithelial lining does not appear to take any part in the growths whatever.

Rhabdomyoma in the lower animals is quite rare. The only cases mentioned that I have been able to find are by Kitt in his Text-book of Comparative and General Pathology. He stated that Johne has recorded an adenosarco-rhabdomyoma in the kidney of a hog which weighed 14 kilograms (about 31 pounds).

From the large size of this growth, coupled with my observations of new growths in the kidney of swine, I would be inclined to look upon this growth as an embryonal adenosarcoma, as these growths are of a very mixed character and striated muscle fibers have been observed in them. Of the remaining two, Gratia observed a rhabdomyoma in an old horse in a dissecting room; a fusiform growth about 8 to 10 cm. in length in the vagus nerve trunk about the middle of the neck. The other was found by Kolessnikow growing in the tail and perianal connective tissue of a 20-year-old stallion. This tumor contained pigment cells to which the name rhabdomyosarcoma melanoides was given. Metastases were found in the liver, skin, pleura and peritoneum.

Concerning the histogenesis of the growths in this particular case and the explanation of the presence of the gland tubules, I am of the opinion that they sprang from misplaced embryonal tissue. The gland elements are probably remnants of the Wolffian body, while the striated muscle cells probably sprang from inclusions of the myotome, which were not separated at the proper place in early embryonal life.

A CASE OF DEMODECTIC MANGE IN A BULL [1]

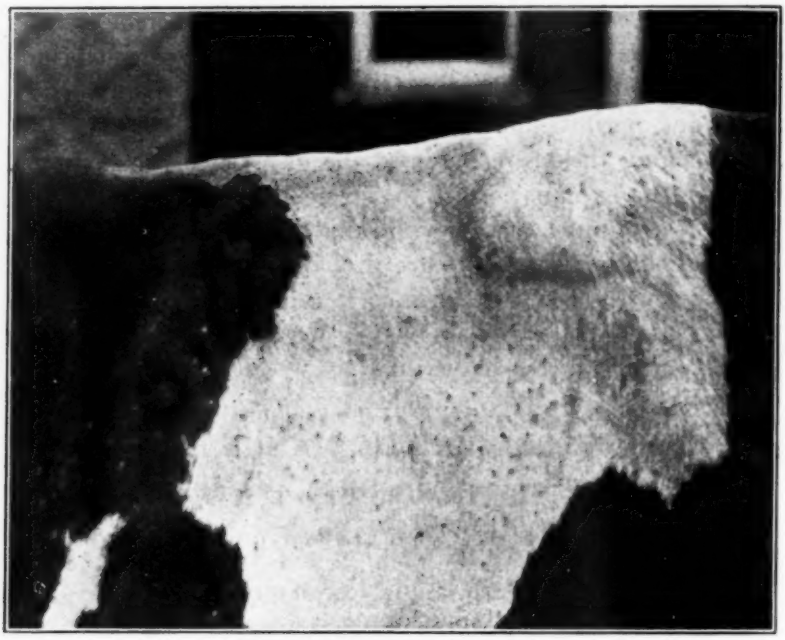
By HOWARD CRAWLEY
Philadelphia, Pennsylvania

ON February 16, 1922, the laboratory of the Bureau of Animal Industry, Pennsylvania Department of Agriculture, received some material which had been expressed from pustules present on the skin of a purebred Guernsey bull. This material, which was of the consistency of soft cheese, contained the parasite of demodectic mange, *Demodex bovis*. The organisms were present in great numbers.

On March 10 the farm on which the bull was located was visited, and the following information obtained: He was born March 23, 1910, and came into possession of the present owner in July, 1920. The skin trouble did not manifest itself until after the close of the year 1921. Observations made at this time revealed a pustular dermatitis extending over both sides, the shoulders, hips and back. The pustules were about the

[1] Contributions from the Bureau of Animal Industry, Pennsylvania Department of Agriculture. New Series No. 9.

size of a small pea, and at the tip of each a minute opening could be distinguished. By exerting considerable pressure a small amount of a white, rather dry pus could be forced from each of these openings. The pustules were rather widely separated, and their effect on the skin and hair was such as to give the animal a somewhat speckled appearance when viewed from a short distance. The condition is illustrated by the figure reproduced from a photograph made at the same time.



Demodectic mange in a bull

Samples of the pus were collected and a microscopical examination made at once revealed the parasites. A bacteriological examination of specimens of pus from several nodules showed *Staphylococcus albus* consistently present.

Several cows of the same herd also showed skin lesions, but these did not resemble those present on the bull. Skin scrapings were made from these cows but the later examination in the laboratory was negative as regards the presence of mange mites of any kind.

Records in the literature of the occurrence of *Demodex* in cattle are by no means abundant. It has been found in cattle in Nyassaland, Africa, and Stiles in a paper published in the

Canadian Entomologist (on *Demodex folliculiorum* var. *bovis* in American Cattle, p. 286) in 1892 showed that the hides of cattle infected by these mites were full of perforations, the result of which was that their value was seriously diminished. It has also been suggested that in cattle as in dogs the dermititis is due to bacteria which are able to invade the skin.

In dogs the parasite is abundantly present. It does not, however, seem to be readily transmissible from an infected to a clean animal. This has been noted in both dogs and cattle, and the data obtained in the present case are in line. Thus the infected bull was one of a herd of some fifty head, and, although kept but partly isolated from the others, was the only animal known to be harboring this parasite.

Neveu-Lemaire (Parasitologie des Animaux Domestiques, 1912, p. 883) gives the dimensions of *Demodex bovis* as about 210 microns long by 50 microns wide. The average dimensions of twenty of our specimens were 216 microns for the length and 56 microns for the breadth. The extremes were 240 and 200 microns for the length, and 65 and 50 microns for the breadth. These figures are somewhat larger than those given by Neveu-Lamaire, more so with regard to the breadth than the length. These measurements were made on specimens mounted in lacto-phenol, and it is possible that there was a slight amount of swelling.

Although this is the first case of domodectic mange in cattle which has come to the attention of the laboratory, the condition is probably commoner than is supposed. Certainly this is a legitimate conclusion from the data given by Stiles. In consequence, it has been considered advisable to report it in detail.

ENTEROHEPATITIS IN A PEAHEN [1]

By HOWARD CRAWLEY *and* E. L. STUBBS
Philadelphia, Pennsylvania

ON January 11, 1922, the laboratory of the Pennsylvania Bureau of Animal Industry received from Wayne, Pa., the carcass of a peahen for examination. The autopsy showed the bird to be in good flesh. The mucous membrane of the mouth was slimy and cyanotic. The lungs and liver were apparently nor-

[1] Contribution from the Bureau of Animal Industry, Pennsylvania Department of Agriculture. New Series No. 10.

mal. The only lesions were found in the ceca. Both of these were affected, but one very much more than the other. In the one more obviously diseased the external surface was marked out in rather faint circular areas, from one-half to three-quarters of an inch in diameter. In addition this entire cecum was greatly enlarged, the wall thickened and the mucous membrane wrinkled and necrotic. The feces both in the ceca and in the intestine were of a greenish black color. From the ceca and rectum twenty-two specimens of *Heterakis vesicularis* were recovered, but the balance of the alimentary canal was free of helminths.

Bacteriological examination of the heart blood, liver and spleen showed no evidence of any infectious or contagious disease.

The macroscopic appearance of the ceca suggested blackhead or enterohepatitis, and sections were made through one of the lesions of which mention has been made. These showed typical examples of "*Amoeba meleagris.*" There is a good deal of dispute in the literature as to exactly what this element may be, but it is at all events entirely characteristic in appearance and its presence is proof that the bird in question was suffering from blackhead. Sections of the liver were negative.

On going back over the laboratory records it was found that on September 24, 1913, the carcass of a peacock was received, the cause of death being diagnosed as blackhead.

A REPORT ON THE USE OF MUSTARD IN SEVENTY CASES OF EQUINE INFLUENZA

By V. G. KIMBALL
Philadelphia, Pennsylvania

DURING the past year seventy cases of influenza were received in the Veterinary Hospital. On those showing respiratory and cardiac complications we decided to try out exclusively the use of mustard applications. Those animals with a respiratory frequency of thirty or more per minute and with a marked abdominal type of breathing were selected. Twenty such cases were treated. The temperature, pulse and respiration were noted before and twelve hours after the application. The average temperature, pulse and respiration of the twenty cases before

was 103.9; 63 and 40 respectively; and twelve hours later 102.6; 61 and 28. Although the bare figures denote improvement, the results were even more gratifying. The general appearance of the animals was better, the pulse was stronger, the "flanky" breathing disappeared and the appetite greatly improved. In many cases the respiratory frequency dropped from forty or more per minute to twenty-eight.

Two pounds of Coleman's mustard was used per application. We found that if applied in a very watery condition the effect was better. If the animals had a heavy hair coat we moistened it with water first and then vigorously rubbed the mustard paste through the hair into the skin. (This is more easily accomplished if the paste is thin.) A newspaper was then applied and a stable blanket over this. The effect was noticeable in five minutes or earlier. The dressing was scraped off in twenty or thirty minutes. In only a few cases was severe blistering observed. The writer could see no benefit in producing a large area of vesication as is insisted upon by many. We believe the beneficial effect to be of a reflex character. Furthermore the application can be repeated oftener if necessary and a continued effect obtained, if vesication is not resorted to. We were also prompted to this action by reason of dealers not wanting the horses marked up before sale.

Only cold water should be used in making the paste. The action of mustard depends upon oils which are evolved by the action of the ferment myrosin. The ferment is liberated when the ground seeds are mixed with water. Hot water, alkalies such as vinegar, acids, etc., may neutralize or interfere with the action of the ferment.—*U. of P. Bulletin, Veterinary Extension Quarterly, No.* 6, *April* 1, 1922.

Dr. C. D. Bailey, formerly in practice at St. Elmo, Ill., has retired from his practice to accept a position with the Liberty Laboratories, as sales representative and laboratory assistant. Several years ago he was on the B. A. I. force in Iowa when hog-cholera control work was inaugurated and was located at Washington, Iowa, where he made many warm friends among the veterinarians of Southeastern Iowa. Dr. Bailey will take up his residence at Ralston, Nebr., and will cover the adjacent territory.

ABSTRACTS

RESUME OF EXPERIMENTS ON FOOT-AND-MOUTH DISEASE. E. Roux, H. Vallée, H. Carré, and the late Nocard. Compt. Rend. Acad. Sci. Paris, vol. 173, Dec. 5, 1921, p. 1141. (Abst. in Bul. Inst. Pasteur, vol. 20, Jan. 30, 1922, p. 76.)

The facts acquired in the course of an experimental study of foot-and-mouth disease—a study pursued since 1901—are set forth briefly in this note. As a source of virus, the pig, employed at the beginning, gave only a rather small quantity of a virus which soon lost its activity. Infected heifers at the period of rising temperature furnish virulent blood. The blood, defibrinated mechanically, placed in closed ampoules and kept under refrigeration between —1 and —2° C., retains its infective power for several months. Accidental contamination which may occur in the course of the collection of the blood does not exercise any unfavorable action on the preservation of the virus. Dilution, on the other hand, renders the virus extremely weak. The lymph of the vesicles and the ground shreds of desquamated epithelium are particularly rich in virus: They are still infective after dilution 1 to 20,000. Pericardial effusion is infective up to 1 to 1,000, while virulent blood serum ceases to show its pathogenic power with regularity if inoculated in doses of less than 0.2 c.c.

Rapid drying does not destroy the virus; it permits its preservation for a variable time, up to 105 days; but infection is not then manifest except after a period of incubation longer than usual; when it does not occur, the inoculated animal remains sensitive to a regular virulent test. The same result is obtained with virulent blood and lymph weakened by age.

Besides intradermic and intramuscular inoculations, which represent severe modes of introducing the virus, and intravenous inoculation, sometimes formidable in its effects, all the experimental modes of infection are incomparably less severe than the forms of the natural contagion.

Experimental foot-and-mouth disease causes at the outset only buccal localizations, without mammary or digital manifestations. Subcutaneous inoculation is a preferred mode (recommended by

Nosotti in 1885). For that purpose it is preferable to employ a virulent blood serum stabilized by holding for a month under refrigeration. The suitable dose is 1 c.c. In hundreds of animals so treated, mammary or digital localizations have occurred only twice.

Immunity conferred experimentally is perfect as soon as it is established, but is transient. The authors have seen it disappear from hypervaccinated subjects in less than six months.

GOAT TUBERCULOSIS. A. Honeker. Monat. Tierheilk. Wochens., 1922, Nos. 5 and 6. (Abst. in Deut. Schlacht. u. Vieh. Zeit., 1922, No. 10, p. 81.)

According to statistics compiled by a goat breeders' association, 6 cases (1 1/3 per cent) of tuberculosis were found among 450 emergency slaughtered goats, and of these one case showed udder tuberculosis. Meat inspection statistics are not conclusive since most of the goats in the country escape meat inspection. According to Hertha the goat ranks third, after cattle and swine. In a herd of 28 animals almost all reacted to tuberculosis; three of the animals were slaughtered and found tuberculous, and it must be assumed that the rest of them were also tuberculous. In Holland the percentage of tuberculous animals was given as 0.153, and in Brunswick in three years it was 0.58. Honeker saw only one case of udder tuberculosis among his eight cases in goats. Hertha likewise observed udder tuberculosis only once in eight cases studied.

In many herds where a large number of goats are affected with a cough and all are apparently tuberculous, the veterinarian is seldom consulted and then only when he shows a special interest in goat diseases.

Honeker describes 11 cases observed by him. Most of them showed lung and liver involvement; there was one case of udder tuberculosis and one in which the testes were affected. The tendency to suppuration and cavern formation in the lungs is especially noteworthy. Tuberculosis of the serous membranes appears to be rare and Honeker did not observe any involvement of the intestines. Instead of calcification there occurs a white or whitish gray chalky deposit, or a sebaceous-like greasy mass in a connective tissue capsule. Mention is made of an infection of a 10-months-old buck from standing for four weeks beside a cow with open lung tuberculosis.

The transmission from goat to goat, according to Honeker's observation, appears to be rare. The author concludes that if science will pay more attention to the diseases of goats it will be sure to receive the support and thanks of the goat breeders.

L. T. GILTNER.

THE VALUE OF TISSUE EXTRACTS OF VIRUS PIGS IN THE PRODUCTION OF ANTI-HOG-CHOLERA SERUM. T. P. Haslam. Jour. Immunol., vol. 6 (1921), No. 4, pp. 263-270 (Abst. in Expt. Sta. Rec., vol. 46, No. 2, p. 183).

The results are reported of experiments conducted at the Kansas Experiment Station to determine whether the expressed or extracted juices from the tissues of virus pigs could be used as a means of hyperimmunizing hogs in preparing anti-hog-cholera serum by the Dorset-Niles method.

The muscle virus was obtained from the ground meat secured under sterile conditions from the hams of virus pigs immediately after killing. Three different methods were used, as follows: (1) The ground meat was frozen and subsequently thawed in such a way that the juices flowed away drop by drop as the thawing progressed; (2) the ground meat was mixed with an equal volume of physiological salt solution and treated as in process 1; and (3) the ground meat was mixed with an equal amount of physiological salt solution, the mixture chilled, and after standing 24 hours pressed through sterile canvas by means of a small screw press. The yield by these methods was about 100, 400, and 400 c. c., respectively, per pound of meat

After attempting intraperitoneal, intravenous, and subcutaneous inoculation of the virus thus prepared, subcutaneous inoculation was adopted as the safest and most satisfactory method of hyperimmunization. The amount of virus given was 10 c. c. per pound weight of the animal. The potency test of the serum from hogs hyperimmunized with muscle virus consisted in inoculating 40- to 50-pound test pigs simultaneously with 2 c. c. of ordinary defibrinated blood virus and a definite amount of the serum to be tested. Check tests were run with serum prepared from blood virus obtained from the same lot of pigs and with virus alone.

Six complete experiments were carried out, in all of which 15 or 20 c. c. of the muscle virus serum, as well as of the blood

serum, was able to protect 40- or 50-pound test pigs against 2 c. c. of ordinary phenolated defibrinated blood virus, while all of the checks promptly developed hog cholera. In one instance in a further test with heavy shotes the serum made from the muscle virus failed to protect two of the shotes receiving only 35 c. c. of the serum, while those receiving the same amount of blood virus remained well. A possible explanation of the less favorable action of the muscle virus is that it had been stored in a frozen condition for several weeks prior to hyperimmunizing the hogs.

A 200,000-c. c. mixture of serum prepared from muscle virus of a considerable number of animals was tested at three different times. Of a total of 24 pigs receiving from 15 to 25 c. c. of this muscle virus serum and 2 c. c. of ordinary blood virus, all remained well except one which died of pneumonia. Nine pigs received 15 to 25 c. c. of check serum and 2 c. c. of blood virus and remained well, but 2 pigs receiving 10 c. c. of check serum and 2 c. c. of blood virus sickened.

The experiments reported are thought to indicate that serum of considerable potency may be prepared from muscle tissue virus.

ON THE NATURE OF LUMBAR PARALYSIS IN THE GOAT. Osamu Emoto. Jour. of Japanese Soc. of Vet. Med., vol. 1 (1922), No. 1, pp. 1-32.

Among the noble races of goat imported here from Switzerland and their offsprings there has been a disease characterized by paralysis of lumbar region, occurring mostly during summer and autumn, while the common races of goat and other domesticated animals having never been attacked. Its introduction into a farm is caused by the importation of diseased or apparently healthy goats from the locality where the disease is prevailing. The appearance of the disease is always sudden; in a slight case the affected animal is dull and inactive, with the weak hind quarters, but if severer it is lying down, unable to rise up. At autopsy there are no remarkable and characteristic changes in internal organs, but always marked sclerosis of the spinal cord and inflammation of the pia.

A certain streptococcus was isolated from the spinal fluid in all eleven cases which were bacteriologically examined, besides

streptococcus a monococcus and a bacillus were found in a few cases. However the streptococcus could never be found in the spinal fluid of healthy goats and other diseased or healthy animals. Eleven healthy goats inoculated with a culture of the streptococcus showed symptoms and anatomical changes similar to those of the natural cases.

Conclusion.—The lumbar paralysis in the goat is an infectious disease affecting the noble races, characteristized anatomically by meningitis spinalis and sclerosis spinalis, its specific cause being a streptococcus.—(Author's abstract.)

PANAMA CANAL ZONE QUARANTINED AGAINST FOOT-AND-MOUTH DISEASE

Owing to the prevalence of foot-and-mouth disease in several sections of Ecuador, the chief health officer of the Panama Canal has issued an order excluding shipments of alfalfa or hay originating in Ecuador into the Panama Canal Zone. Although the disease has been known to be present in South American countries, it has not been until recently, serious in Ecuador and other regions near the Canal Zone. The U. S. Bureau of Animal Industry has been notified of the quarantine order affecting the Canal Zone and its inspectors at Southern ports of entry are exercising special vigilance.

Dr. Lowery, Eastern Division Supervisor of the Canadian Health of Animals Branch, is making a tour of inspection in Western Canada.

Dr. J. A. Barger, President of the Mississippi Veterinary Medical Association, reports that as a direct result of tick eradication in his State there is a better tone to the cattle market than has existed for some time past. In addition, the dairy products of Mississippi have advanced from $750,000 in the past few years to more than $15,000,000 in 1921. One small dairy section, where during the first year of the dipping in 1917 only $84,000 worth of dairy products were sold, produced in 1921 over $500,000 worth of the same products, and in April, 1922, their dairy business was 50 per cent greater than for the corresponding month of the previous year.

ARMY VETERINARY SERVICE

CHANGES IN ARMY VETERINARY CORPS

Lieut. Col. J. A. McKinnon has been ordered to Washington to the Army Medical School, and it is understood that he will be Director of the Veterinary Corps upon the transfer of Col. Morse. It is also reported that Major W. R. Pick will relieve Lieut. Col. Stanclift.

Col. McKinnon was born in Canada. He entered the United States Army from Montana, and was sent at once to the Philippines. In 1910 he returned and took a postgraduate course in Toronto University. During the war while in the Philippines he was sent as Chief Veterinarian to the American Expeditionary Force in Siberia. At the close of the war he was ordered to the Meat and Food Inspection School at Chicago, graduating in 1921.

The veterinary profession of the United States will be pleased to learn that a veterinarian has been selected to take charge of the Army Veterinary Service, and they will give Col. McKinnon their hearty assistance in making this Service better and more efficient in every way.

Veterinarians, both civil and military, owe a debt of gratitude to Col. Morse, who has so ably directed the Veterinary Corps during the formative stages, and their best wishes go with him on his assignment to other work.

THE BUCK PRIVATE AND THE CADUCEUS [1]

By MAURICE C. HALL
Washington, D. C.

Whin Oi wint into the Arrrmy
  Oi was so very grane,
Oi had to ask of iverything
  And just what did it mane.
There was so much insignia
  Oi made some grand mistakes,
But the wan that fooled me mostly
  Was the rod wid twisty snakes.

Sure, the crossed swords is the cavalry;
  The doughboys has crossed guns;
Crossed cannons is artillery,
  Both big and little ones.

[1] Written for the third annual dinner of the Helminthological Society of Washington, D. C., April 1, 1922.

The Q. M. has a little wheel;
A shell the Ordnance takes;
But who's the man that wears the rod
That's twined wid twisty snakes?

Well, Oi wondered on this mather
Fer at laste a week or two
Till Oi woke up one fine morning
Wid an awful case of flu,
And at sick call Oi reported
And he sez: "Oi know these fakes.
Just mark him 'Duty,' sarjent,"
Sez the bird that wears the snakes.

Whin Oi tells it to me comrades,
They sez: "Sure, it's always so.
If it's just a bluff yer pulling,
To the hospital ye go.
But whin wid the flu yer falling,
Or yer blooming leg ye breaks,
'Just mark him "Duty," sarjent,'
Says the guy that wears the snakes."

MISTAKES

When a plumber makes a mistake, he charges twice for it.

When a lawyer makes a mistake, it is just what he wanted, because he has a chance to try the case all over again.

When a doctor makes a mistake, somebody buries it.

When a judge makes a mistake, it becomes the law of the land.

When a preacher makes a mistake, nobody knows the difference.

When an electrician makes a mistake, he blames it on induction; nobody knows what that means.

When a printer makes a mistake, he gets the "devil."

But when an editor makes a mistake, GOOD NIGHT!!!—*Ex.*

Dr. Wm. H. Mahon, who was formerly corporal in Company No. 1 of the Veterinary Corps, Camp Greenleaf, Ga., has been appointed as Inspector of Meat, Slaughtering and Provisions at Pittsfield, Mass. The "old buddies" of the Doctor will be pleased to learn of this recognition.

The report has reached this country from England of the death of one of Princess Mary's favorite horses, which succumbed to tuberculosis within the last few days.

ASSOCIATION NEWS

OFFICIAL ROUTE TO ST. LOUIS

One of the best features of going to a convention is the opportunity one has of meeting his fellow practitioners, and engaging in conversation with them, not only at the convention, but in going to and from the meeting.

In order to give the members an opportunity of traveling together, because the Wabash Railway covers a considerable portion of the territory in the Central West, the Wabash has been named as the official route for the next A. V. M. A. convention, St. Louis, beginning August 28.

Trains will leave Buffalo, Toledo, Chicago, Des Moines and Omaha at convenient times and convenient hours so that the members can arrive in St. Louis early Monday morning. The Wabash Railway promises to extend every courtesy to the members of the A. M. V. A. N. S. MAYO, *Secretary.*

THE A. V. M. A. CLINIC

On August 30 and September 1 the A. V. M. A. expects to hold the largest and best veterinary clinic ever held in the United States. Dr. Huggins, B. A. I. veterinarian in charge at East St. Louis, and the Stock Yards Company are arranging a pavilion for the large animal clinic, and the small animal clinic will be probably held in the assembly room of the Exchange Building.

The material for the clinic is so planned that everyone can see without crowding and the clinic will be carried out on a definite schedule. Dr. Kingman of Colorado, Director, and Dr. T. L. Stewart of Kansas, Assistant Director of the large animal clinic, are men of wide experience who do things. Dr. Flynn of Kansas City is well known as a small animal clinician and he is going to give the canine practitioners an up-to-date clinic.

It is expected that those members who are not particularly interested in the clinics can attend sessions of the Section on Sanitary Science and Police or Education and Research that will be held at the Planters Hotel at the same time the clinics are being carried out.

SOUTHEASTERN STATES VETERINARY MEDICAL ASSOCIATION

The sixth annual meeting of the Southeastern States Veterinary Medical Association, which was held at Nashville, Tenn., in March, was one of the best conventions that the Association has ever enjoyed. The attendance was unusually large considering the present financial situation of the country.

The convention was presided over by President Dr. M. R. Blackstock. Mr. J. O. Tankard welcomed the association on behalf of the city of Nashville, to which Dr. W. A. Barnette responded.

The President's address outlined the history of the association and predicted a great future for the veterinary profession in the South.

Dr. A. T. Kinsley, President of the American Veterinary Association, addressed the convention on "The Veterinarian's Future." His views were very optimistic, yet they were substantiated by convincing facts about the profession.

One of the most interesting and instructive papers ever presented to the association was given by Dr. Louis A. Klein, University of Pennsylvania, on "Mastitis." He presented many new features about the cause and treatment of this disease.

A unique feature of the program was a moving picture illustration and discussion of "Intestinal Parasites in Swine," presented by Dr. E. I. Smith, through the courtesy of Dr. B. H. Ransom, Chief of Zoological Division, B. A. I.

A clinic was planned by, and held at the hospital of, Dr. W. M. Bell. An interesting feature of the clinic was a discussion and treatment sterility by Dr. J. F. DeVine, Goshen, N. Y.

Other features of the program were: "Scours in Young Cattle," by Dr. M. Jacob; "Experience with a Recent Outbreak of Anthrax," by Dr. C. C. Brown; "Tuberculin Accredited Herd Campaign in Virginia," by Dr. J. G. Ferneyhough, and "The Practitioner's Relation to Sanitary Control Work," by Dr. G. R. White.

The growth of the Association may be noted by the election of thirty-two new members at this session and by the interest shown in this meeting.

The date of the meeting of the association was changed by

unanimous vote and a permanent date fixed for the third Monday and Tuesday of November in each year. The next meeting will be held at Chattanooga, Tenn., November 20 and 21, 1922.

The Secretary's report showed that during the past year death had claimed the following members: Drs. W. A. Downs, Cordele, Ga.; M. A. Morris, Savannah, Ga., and L. R. Gerstung, Lakeland, Fla. Resolutions of sympathy and respect were adopted and copies mailed to their respective families.

In the absence of Dr. Tait Butler, Dr. J. G. Ferneyhough acted as toastmaster at the banquet held at the Hermitage Hotel.

The following officers were elected and installed for the coming year: President, Dr. W. M. Bell, Nashville, Tenn.; First Vice-President, Dr. W. K. Lewis, Columbia, S. C.; Second Vice-President, Dr. M. Jacob, Knoxville, Tenn.; Third Vice-President, Dr. A. L. Hirleman, Atlanta, Ga.; Secretary-Treasurer, Dr. John I. Handley, Atlanta, Ga.

JOHN I. HANDLEY, *Secretary-Treasurer.*

PROCEEDINGS OF THE WISCONSIN ASSOCIATION

The proceedings of the Seventh Annual Meeting of the Wisconsin Veterinary Medical Association, held January 18, 19 and 20 at Madison, Wisconsin, recently appeared in print. The Publication Committee, of which Dr. Frederick B. Hadley was chairman, deserves much credit for the attractive appearance of the publication.

IDAHO EXAMINING BOARD

The Idaho State Veterinary Examining Board met in the Capitol Building, Boise, Idaho, on May 9. Thirteen applicants were examined for license to practice veterinary medicine and surgery in the State of Idaho. The Board consists of R. B. Hurd, of Payette, president; H. E. McMillan, of Filer, secretary, and E. J. Pamell, of Lewiston, treasurer.

OKLAHOMA EXAMINING BOARD

The Oklahoma State Board of Veterinary Medical Examiners held the annual examination on June 26, 27, 28, 1922, at the State Capitol. Dr. D. W. Gerber, of Oklahoma City, is secretary of the Board.

INDIANA VETERINARY COLLEGE

The graduating exercises of the Indiana Veterinary College took place on May 19, the following students receiving diplomas: Carlos C. Byler, Callao, Mo.; Henry O. Chapman, Genoa, Ill.; Murray J. Dills, Decatur, Ill.; Hall A. Dockstader, Otranto, Iowa; Dolie Hancock, 330 Fulton St., Indianapolis, Ind.; Guy P. Hatchett, 603 Cherry St., Chattanooga, Tenn.; Ralph B. Hipenbecker, Fennimore, Wis.; Walter F. Holmgren, Platte, S. D.; Troy S. Hopkins, Eldorado, Ill.; Joseph G. Johnson, Gowrie, Iowa; Emmett E. Keigan, Middletown, Ind.; Norton H. Larson, Spring Grove, Minn.; Fred W. Milke, 605 5th Ave., Milwaukee, Wis.; Ralph G. Routon, Camby, Ind.; Francis D. Sexton, Hortonville, Wis.; William P. Tague, 1639 Wabash Ave., Chicago, Ill.; Thomas W. Todhunter, Wilmington, Ohio; Jasper B. Vance, R. R. B., Box 326, Indianapolis, Ind.; Jasper C. Vance, R. R. B., Box 326, Indianapolis, Ind.; Lee A. Wilcox, Clearfield, Iowa, and Ary S. Willard, Fairland, Ind.

Dr. George Hilton, of Ottawa, Canada, Chairman of the Executive Board of the A. V. M. A., has been ill for the last two months with nervous exhaustion. Dr. Hilton has been ordered to take a complete rest for several months more. THE JOURNAL wishes him a speedy convalescence and that he will be fully recovered in time to attend the St. Louis meeting in August.

Dr. Adolph Eichhorn and wife, of Pearl River, N. Y., left New York City on their European tour on June 3. During his trip Dr. Eichhorn will visit most of the European countries and it is expected that he will return in time to furnish an interesting report of his travels to the A. V. M. A. convention at its St. Louis meeting the last of August.

Dr. Guy Parker Hatchett, of Winchester, Tenn., and Miss Dolores Healy, of Indianapolis, Ind., were married May 24, at Indianapolis. Dr. Hatchett is a 1922 graduate of the Indiana Veterinary College and a member of the Theta Chapter of the Alpha Phi Fraternity. They will make their home in Chattanooga, where Dr. Hatchett will practice.

COMMUNICATIONS

TICK PARALYSIS

To the Editor:—

Upon reading the article in the April number of the JOURNAL under the heading "Tick Paralysis," Sidney Dodd, *Jour. Comp. Path. and Ther.*, Vol. 34 (Dec., 1921), part 4, pp. 309-323, the writer is reminded of an instance in his practice some thirty-five years ago at Circleville, Ohio, in which he was called to attend a number of horses owned by a man named Carpenter who lived in that vicinity. These horses, some of which were young, were running in a woods pasture and several were showing symptoms of paralysis. One or two were down and unable to stand even when lifted to their feet, and had to be hauled to the barn on a sled, after which they were put in slings, by the aid of which they were able to rest upon their feet.

Upon a close inspection numerous large ticks were found on the horses, located principally on the skin of the tail and neck at the roots of the long hair. These ticks were called wood ticks, but I did not know at that time, nor do I now know the technical name of the ticks. Upon removal of the ticks prompt recovery of all the horses took place. Even the one or two in which the symptoms were so pronounced that the animals could not swallow or rise to their feet, promptly regained a normal condition. In addition to removing the ticks medicines were administered, but the prompt recovery was attributed more to the change of location and removal of the ticks than to the medicinal treatment.

Whether the ticks were the causative factor of the trouble, or whether the injurious effects were caused by some other agency in the woods pasture I do not know; but at that time and ever since I have strongly suspected the ticks as causing the trouble.

During the summer of 1884, soon after I began practice, I met with an outbreak of paralysis in four horses, which deeply impressed me at that early date of the probability of serious toxic effects in animals, especially horses, from parasites. These horses showed symptoms of paralysis, and early in the attack lost the power of deglutition and later went down, being unable to stand. All four horses died, and in one which was examined after death the intestines were literally packed with parasites

of different varieties. There were fifteen tapeworms and several quarts of large roundworms. At that time this trouble was called cerebro-spinal meningitis. More recently, of course, such conditions are classed under different names, such as forage poisoning, etc. These horses were running on woods pasture and getting their drinking water from a pond.

Many other experiences in addition to the instances related above have impressed the writer all through his professional career with the strong suspicion that much greater harmful effects in animals result from parasitic and tick infestation than has been generally suspected.

G. W. BUTLER.

Indianapolis, Ind.

TWIN MARE MULE COLTS

To the Editor:—

I was called recently to deliver a horse colt, and this is what I got—twin mule colts.

This is unusual and may prove of interest to JOURNAL readers and the profession in general, so I am enclosing a photograph of them.

LINK GRIGSBY.

Walkerton, Ind.

NECROLOGY

Margaret C. Schaufler, wife of Dr. C. A. Schaufler, inspector in charge of the Bureau of Animal Industry station at Philadelphia, died on May 17 from a complication of kidney and heart troubles.

Mrs. Schaufler was an active worker in the Christian Church and was deeply interested in community welfare movements. Her own sunny disposition was radiated in her every-day life. She leaves a husband, son and a host of friends to mourn her loss.

MISCELLANEOUS

VERMINOUS VERSES

Again the Helminthological Society of Washington has had its annual dinner, and again Dr. Maurice C. Hall has perpetrated a lot of rhymes at the expense of his long-suffering colleagues. A few type specimens are presented below, and others will be given elsewhere.

Place card for the President, Dr. Cooper Curtice

One, two
Treatments will do.
Three, four
Will do more.
Five, six,
Dip the ticks.
Seven, eight,
Watch the date.
Nine, ten,
Dip again.

Little Bo-Peep

Little Bo-Peep
Has lost her sheep
From stomach-worm infestation.
She should have applied
Copper sulphate inside,
And kept up a pasture rotation.

To Dr. C. W. Stiles

Good little writers never say:
"You are a fossil or a cheese!"
O, no! That never is the way,
But: "May I differ, if you please?"
Good writers never make new names
In groups of which they nothing know.
They study the material first.
(It is a lot of trouble, though.)

To Dr. Albert Hassall and the Steel Memorial Medal

We'll say we're pleased you got it, sir!
The whole blamed bunch today is glad!
We know the pile of work you've done,
We know the sort of job you've had,
We know the pains you've taken, too,
With every single index card
That went into the catalogue—
And we'll say, too, that you worked hard!

We know the high and far-off days,
The old collections that you made;
We've seen the superstructures built
Upon foundations that you laid.

Of years full thirty-five have gone
Since first you joined the B. A. I.
May the good work go on for years,
Achieve as much and rank as high!

And while we're on this subject, too,
The Royal College has our thanks.
Long may it turn out men like you,
To swell the number in our ranks.
Long may its judgment be as sound
As when they gave this medal here.
A toast to Doctor Hassall, then!
And for the R. C. V. a cheer!

Reply attributed to Dr. Hassall

I am weary of having my photograph
Printed with legends that make me laugh.
It wouldn't have been so bad by half
If it hadn't have been for that.
But when the Steel Memorial was called
A medal of steel, it surely galled.
It's easy to see why I'm almost bald,
And no need to blame my hat.

CORRECTIONS IN DR. BARNES' ARTICLE

IN THE paper on "Bovine Infectious Abortion," by Dr. M. F. Barnes in the JOURNAL for May, 1922, page 133, some unfortunate errors occurred. Corrections should be made as follows:

Page 134, second line, "because" should be "before," making the sentence read: "Bovine abortion was recognized as epizootic in nature before the cause was discovered." "Hudecoper" should be "Huidekoper."

Page 134, fifteenth line, the sentence beginning, "In conclusion with," should read, "In conjunction with," etc.

Page 138, in the seventh line of recommendation 27, the sentence should read: "It has not been proved that it does not do damage." (The first "not" was omitted, thus reversing the author's meaning. Evidently the double negative was too much for the printer.)

Page 142, first line, "6 to 120 days" should read "60 to 120 days."

It is suggested that readers make these corrections in their copies.

For the mistake in Huidekoper's name the JOURNAL has an alibi; for the others it must accept the blame.

All these errors, with one possible exception, are of a kind that is peculiarly difficult to detect in proofreading, as the erroneous form "makes sense" and there is nothing to attract attention to the error. Probably the best way of guarding against such mistakes is to send a proof to the author, but time does not always permit of this.

We regret exceedingly that Dr. Barnes was made a special victim of the "jinx" by the grouping of errors in his paper in a way that rarely happens.

UNKNOWN DISEASE KILLS MANY EWES IN KENTUCKY

For the third consecutive season an unusual condition again is developing among sheep in the State and causing the death of from six to eight per cent of the animals in different flocks, according to a report from the Kentucky Agricultural Experiment Station where studies are being made to determine the nature of the trouble and the best methods of controlling it. Observations made indicate that the condition occurs during February and March and is confined to ewes in advanced pregnancy. It is said to be fatal to practically 100 per cent of the animals that become sick.

Early symptoms of the disease are sluggishness and a tendency to lie down. Infected animals get up with difficulty, walk with a staggering gait and often with the head held to one side. As the disease advances, muscular twitching may set in and the animal stands with its head pressed against some object. Animals showing symptoms of the disease grit their teeth, gradually lose their appetite, become blind and breathe laboriously. The temperature remains normal. Before death the animals become prostrate and move their feet while lying on their sides.

While a number of investigations have been made on the disease, veterinarians at the station have been unable to find infectious organisms connected with it; attempts to transmit the disease to other sheep have been unsuccessful, and no growth has been recorded on culture media inoculated from the blood and tissues of sick animals. In several cases sick sheep were given an injection of botulinus antitoxin in an effort to determine the relation of the disease to forage poisoning, but in no case has the animal been benefited by the injection.

Preventive measures being recommended by the station vet-

erinarians suggest that pregnant ewes be given good care, with as much variety of feed stuff as possible and that laxatives, such as salts or oil, be used freely. Exercise for the animals also is recommended.

NEW LIVE STOCK ESTIMATING AND REPORTING SERVICE PLANNED

Plans for a nation-wide livestock reporting service showing the monthly changes in the livestock situation on farms are now being made by the United States Department of Agriculture, under the Congressional appropriation recently made for this work. The service will also include the forecasting and reporting of the important livestock movements.

At recent conferences of statisticians and crop and livestock estimating experts it was felt that the monthly reports of changes on the farm should include reports of births, deaths, losses, marketings, purchases, and animals bred, with periodical classifications of the numbers of animals on farms. This service will be an expansion of experimental work carried on by the Division of Crop and Livestock Estimates during the last three or four years. Monthly reports will be obtained from 70,000 to 100,000 farms, and States indexes of changes at least for the corn belt, and Eastern and Southern States will be developed. The range States on cattle and sheep will be covered by a series of semi-annual reports because of the difficulty of getting monthly reports from those States.

The forecasting and reporting of the important livestock movements will be based upon the movement of feeder cattle and lambs from the range States to the corn belt feed lots, the movement from the feed lots to market, the movement into the Eastern feed lots such as Lancaster, Pa., and the movement out, the forecasting and estimating of the yearly lamb and calf crop of the range States, and estimates of the feeder hog movement in the Middle West. A careful study is now being made of possible methods for gathering and reporting this information.

At conferences held to develop a livestock reporting program, representatives of farmers' organizations, cooperative livestock shipping associations, the packing establishments, and other livestock interests were present. Many large livestock producers' associations in the West have also indicated a desire to cooperate.